PRIMER OF HORTICULTURE

J. WRIGHT

HORTICULTURE

TEN LECTURES

DELIVERED FOR THE SURREY COUNTY COUNCIL

BY

J. WRIGHT, F.R.H.S.

(HORTICULTURAL INSTRUCTOR)

ASSISTANT EDITOR OF THE "JOURNAL OF HORTICULTURE"
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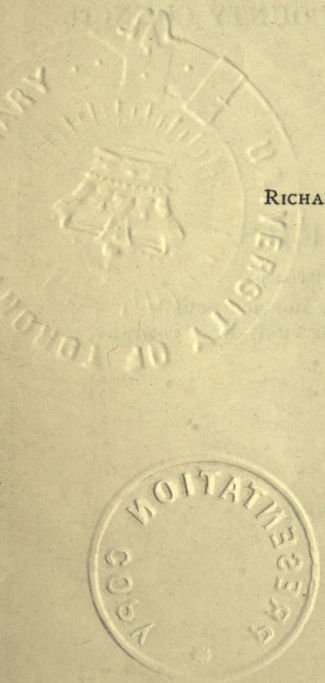

PREFACE

Among the subjects chosen to be taught in rural and semi-rural districts by the Technical Education Committee of the Surrey County Council, "Horticulture," or practical gardening on a sound basis, was accorded a prominent place. The lectures which were delivered in furtherance of that object met with great acceptance, and they are published in accordance with the pressing requests of several audiences. These were of a widely representative character, but mainly composed of the industrial classes, chiefly workers on the land. But having in view the decision of the Education Department to sanction the teaching of Horticulture in schools, separate classes were provided for schoolmasters and teachers, many of whom gladly availed themselves of the opportunities afforded for acquiring knowledge on gardening in its various aspects.

As the result of one course only of these lectures

a number of students, who had no practical experience in gardens, desired to sit for examination, as suggested by Mr. H. Macan, M.A., F.C.S., the active Organizing Secretary of the Education Committee. The examination was the first of the kind made by any County Council after lectures on gardening. It was conducted simultaneously in different centres, under supervision, and without books of reference. The highly competent Examiners appointed by the Royal Horticultural Society—Dr. Maxwell T. Masters, F.R.S., and Mr. James Douglas, F.R.H.S., found on scrutinizing the papers that out of 72 candidates 28 exceeded the minimum standard number of marks (100), and two were awarded medals, with 225 and 205 marks respectively, out of a possible 300.

Now, with the lectures (necessarily much condensed) before them the candidates may be expected to render themselves still more proficient, and it is hoped the publication of the course will be the means of enabling a large number of workers on the land to obtain knowledge that will lead to a greater supply of useful produce from their plots, and render the surroundings of their homes more generally interesting and attractive.

Acknowledgments are due to H. R. Williams, Esq., P.M. of the Worshipful Company of Fruiterers, for the use of illustrations from *Profitable Fruit*

Growing for Cottagers and Small Holders (Gold Medal prize essay); to Messrs. J. S. Virtue and Co. Ltd., for a similar use of subjects from the *Fruit Growers' Guide;* and to the Council of the Royal Horticultural Society and their Examiners for their services. My thanks are also due to Mr. Alex. Dean, F.R.H.S., Mr. Edward Luckhurst, F.R.H.S., Mr. W. K. Woodcock, F.R.H.S., and Mr. W. P. Wright, F.R.H.S., for their able co-operation in teaching practical Horticulture in various centres in the county of Surrey.

J. WRIGHT.

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HORTICULTURE

LECTURE I

THE ADVANTAGES OF ALLOTMENTS AND HIGH CULTURE OF THE LAND

THE advantages of cultivating a plot of ground of any size, from the few poles of an ordinary cottage garden up to an acre or any larger extent are various; but the results differ in the most extraordinary way.

In some instances we have excellent crops of all kinds, a full and bountiful yield of great advantage to the tillers; while in others the crops are inferior or unprofitable, and of little or no use to their owners.

Observe, the staple of the land is alike in the same field, in which the good crops and the bad are side by side; the rain falls and the sun shines on all alike. Why then the difference? Clearly it is a question of men and their methods, and nothing else.

The good results are the direct outcome of sound management—intelligent routine. The unprofitable crops represent mismanagement in the form of either neglect or lack of knowledge on the part of the workers.

One of the most gratifying features in connection with soil cultivation, especially in its most advanced aspects, known as gardening, is that the pleasures and benefits accruing are in no sense measurable by the extent of the operations.

Thousands of small plots of ground could be indicated varying in size from the eighth of an acre to upwards of an acre, which are even more prized by the tillers than are some of the greatest gardens in the land by their opulent proprietors.

That is a very pleasant fact, and affords the best of all reasons for enabling every man to have a plot of land who is willing and able to till it profitably—where land is to be had on equitable terms. This affords him an opportunity for striving to excel as a cultivator, and in accordance as he succeeds will he become contented in his home; and the example he sets to his family, and to the less thrifty persons around him, cannot fail to be beneficial in its tendency.

It cannot be too strongly enforced that it is not the land which gives the increase, but the men who till it. It is their efforts, conducted on right lines, that give to the earth its producing power, and the source of this power may be traced to the twin agents of cleanliness and fertility. Work the land well, feed it well, keep it clean, then and then only will it reward the cultivator with bountiful crops; or to put the case in motto form easy to be remembered:—

Fertility of the soil with freedom from weeds is the secret of success in high cultivation.

It does not follow that soft weeds, such as groundsel, that spring up late in the season after the useful

crops are gathered, do any material harm, but, on the contrary, if dug into the ground before they flower and produce seed, they may even do a measure of good in decaying. The point to remember is this: that all the time weeds are permitted to grow *with* and *amongst* useful crops, the weeds will have their share—and it is often the lion's share—of the food which in their absence the useful crops would appropriate and be the better for.

In the case of light, or sandy land especially, it is often better to scatter seeds of a green crop on the surface late in the summer and work them in with a rake than to leave the land bare. In gardens turnip seed is often sown, and if bulbs do not form, some of the tops are cut and used in early spring and the remainder dug in as green manure. On farms rape and mustard are sown for this purpose. But tares or vetches are far better, for they accumulate nitrogen and leave the earth richer in that valuable element than do either turnips, mustard, or other green crops, which do not belong to the pod-bearing family.

This is important, because nitrogen is the most costly and potent element in manures, and it gives to nitrate of soda its remarkable power in promoting growth. This subject will be dealt with more fully in Lecture IV. of the series.

The advantages of high culture of the land are shared by three sections of the community:—1. Owners of the land; 2. Tenants or cultivators; and 3. Consumers. Whether the land is divided into small plots or large holdings makes no difference, the facts are as stated. The land which yields the most enables the cultivator to obtain the greatest value from it, and consequently to pay higher rents than would be possible with poor or ill-managed plots or fields, therefore both owners and tillers are benefited;

while the greater the bulk and better the quality of the crops raised, the greater the advantage must be to the consuming public who have to purchase their supplies.

The custom of limiting all men, regardless of their cultural capacity, to prescribed quantities of land is based on unsound economic principles. Those men who manage land the best should be encouraged the most. Land-starvers ought to be discouraged, and not permitted to spoil land which in capable hands might be rendered highly productive.

The man who by his labour and judgment obtains the most from his plot year by year does the best for himself, the best for the land, and the best for the community. Yet according to the custom that prevails, no more encouragement is given to such a man than to his slovenly neighbour, whose plot bears on its face the unmistakable brand of negligence.

Every man should have an incentive to endeavour—something to hope for, something to win. An owner of a field of allotments reserves to himself the right to vary the rent according to the results. He takes note of the condition of the plots during the season and puts a shilling or two of rent on the worst, and takes a shilling or two off those which are managed the best. Thus the negligent are fined for their negligence—when this is proved, not otherwise, as in the case of misfortune—while the thrifty are rewarded.

If a negligent man becomes unpleasant over the matter, his plot is simply handed over to a man who has proved by his work that he can manage it well. But this seldom happens, as the risk of incurring the penalty on the one hand, or gaining an advantage on the other exerts a wholesome influence, and the plots

are remarkable for their uniform excellence throughout.

When high cultivation has been pursued and more profitable crops grown, such as high-class fruit, early and superior vegetables, and even flowers, the value of land has been materially increased and higher rentals easily obtained at the expiration of tenancies. Cultivators have found their work remunerative, and landowners have profited correspondingly.

It was once thought by pessimists that our climate and soil were fatal to the growth of such hardy fruit as that which flooded our markets from abroad, and that in future we should be dependent on those supplies; but when great international shows of fruit have been held at which the best of the world's produce was brought together, home-grown apples and pears and plums, taking them in the bulk, have borne the palm for excellence.

To the Royal Horticultural Society belongs the credit of arousing public interest in apple culture by collecting 10,000 dishes of fruit in 1,000 varieties from various parts of the country in 1883. Subsequently the Society gave a great stimulus to pear culture in the same way. These great gatherings, and the lectures and discussions in connection with them, caused many trees to be planted which are now in bearing.

In 1888 another great conference was held, to which cultivators were invited to send the best samples of the most useful varieties of apples and pears. The display was remarkable, and the fruits a credit to the nation.

In 1889 an ancient City guild—The Worshipful Company of Fruiterers—took a more active part than hitherto in advancing the movement, and, in order to obtain the best information they could for

disseminating among cottagers and small farmers mainly, offered a prize of 25 guineas, given by Mr. H. R. Williams (a Past Master of the Company), to which was added a gold medal by the great pomologist, Dr. Robert Hogg, for an essay on Fruit Culture. The essay has sold in thousands and, it

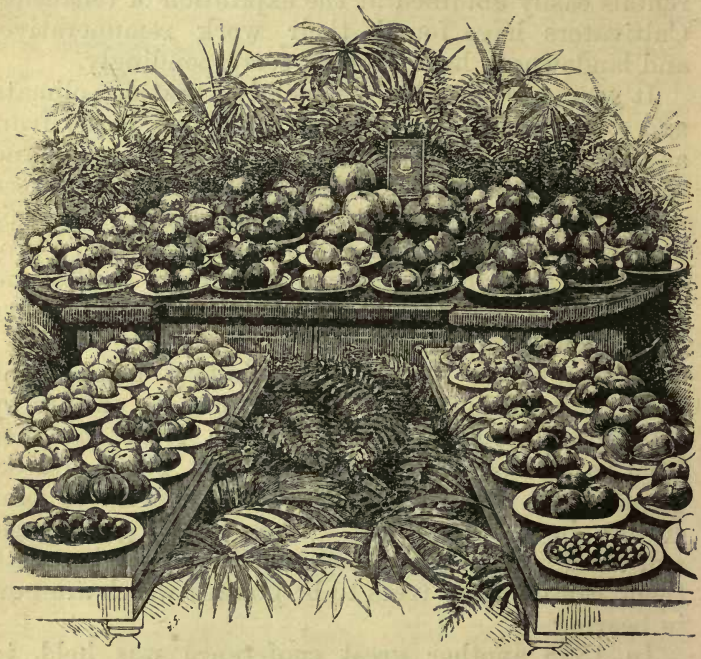

FIG. 1.—A ROYAL PRESENTATION OF HOME-GROWN FRUIT.

is hoped, has done good and will still do more. It can be had for a shilling from 171 Fleet Street.

Then followed in 1890 an exhibition of home-grown fruit in the London Guildhall, under the auspices of the Fruiterers' Company, of which Sir James Whitehead Bart., M.P., was then the Master.

The exhibition was an extraordinary one. It was visited by 35,000 persons, and demonstrated that the finest of hardy fruit could be grown in British soil.

Selections of fruit were made from the collections and sent to and accepted by the Queen with a copy of the essay referred to. A photograph was taken of this royal presentation and engraved for the *Journal of Horticulture*. The illustration, greatly as it is of necessity reduced, affords an idea of what can be done in England by good cultivation.

What may be termed the garden culture of fruit and choice vegetable crops for sale cannot be successfully conducted in small field plots in remote country districts, far distant from railways in direct communication with great centres of population; but such crops can be grown much better than they are now in gardens attached to homesteads. Families may have better supplies than heretofore of what is wholesome and delicious, while those who are gardenless in the localities and adjacent towns will be glad to take the surplus when fresh and of the first quality. It is low quality produce that finds no sale. The best is always in demand at prices which are remunerative to the growers.

Splendid culture is displayed in some field plots, and evidence of taste and loving care is apparent in bright windows and forecourts, as well as in full and well-cropped gardens generally; but these are in the minority, a minority, however, which is happily becoming less yearly, especially in districts where encouragement has been given to induce a more general indulgence in the healthful and delightful pursuit of domestic gardening.

Our wish is that all shall be taught to make their gardens and plots to the fullest extent useful and

enjoyable. We are earnest in this work, and hope to incite earnestness in others, because we know it is for the good of all. We wish to see mutual trust, confidence, and goodwill prevail among all sections of the community, for it is only by a linking together of the best efforts of all that the greatest number of homes can be made happy and the nation prosperous and strong.

QUESTIONS AND ANSWERS

Among questions that have been asked and answered at the close of the Lecture were the following, which elicited replies of general interest:—

Q. Admitting the force of the argument, that men should not be allowed to spoil land that does not belong to them, would not a landlord soon get himself disliked if he ejected the "land starvers" as you call them? and would it not be a good thing if the men themselves, or a certain number of them, should decide when a plot was doing the holder no good while the land was being wasted?

A. If a landowner desired to make himself popular with the indolent as well as the industrious, even the former could not blame him for any action advised by their fellow workmen. The proposition is novel, but worthy of record and consideration.

Q. Do you know if any difficulty arose in the case where slight additions were made to the rent of ill-tilled or neglected plots?

A. No; the men, as a body, accepted the proposal in the same pleasant manner in which it was made; it induced them to examine more closely the several plots, and their comments had, perhaps, as much effect in leading to the improvement that followed in many of them as had what may be termed the operation of the sliding scale in rent.

Q. Is the growing of a green crop of turnips or tares through the winter for digging-in in the spring as good for heavy as for light soil, and if not, why not?

A. Strong land is not equally benefited by the practice. It needs aëration, and is often greatly improved by rough digging in the autumn. Moreover, the retentiveness of heavy land

enables it to "hold" the valuable fertilizing nitrates, which escape from very sandy soil more quickly when it is bare than when covered with a green crop.

Q. Can nothing be applied to light land to improve it, and prevent "drying out," besides farm-yard manure?

A. Yes; agricultural salt is good, because of its great affinity for moisture, and a dressing of 2 ounces to the square yard, or about 4 lbs. per rod, scattered evenly on the surface immediately after sowing and planting, is good for all crops in dry soils distant from the sea. Another dredging may be given later between the rows of growing crops early in a dry season—not on the plants—and lightly hoed in. A mixture of kainit, superphosphate of lime, and nitrate of soda would double the produce of many crops in light porous soil; but this subject will have attention in another lecture.

Q. Can fruit be profitably grown in sandy soils?

A. Not as a rule, if very sandy; but a serviceable home supply may be had by covering the ground thickly over the roots with manure in April or early May, to remain through the summer and decay, also by giving liquid manure, including soapsuds and house or bedroom slops, whenever obtainable. Mr. T. Sharpe grows highly profitable crops of strawberries in what resembles a sand-bed, near Virginia Water. Black currants and raspberries are the least likely to succeed in light, dry land.

Q. How much land can an employed labourer work fairly in his leisure hours?

A. That depends on the land and the man. Heavy land needs twice the labour that light land does; and a man who delights in gardening will do twice the work that another will who takes no pleasure in it. It is better to work twenty rods well than forty badly; or to have a rood clean and fertile than an acre slovenly and exhausted. Those men should have the most land who manage it the best, whether it is apportioned in rods to labourers or acres to farmers, because the one class improves and the other depreciates the value of land.

Q. Do you think a man who is in full and regular employment can manage a rood of land to his advantage in his spare hours?

A. Many do this; but others would be better with half the quantity. A rood (¼ acre) of good land well managed will grow from two to three tons of potatoes besides some other crops, and the produce must be of advantage to the tillers.

Q. Do you know of any instances of working men having allotments of an acre?

A. Yes; many, and many who have two acres managed well, but the men are not in full employment as wage earners, and are always ready and glad to work when wanted by the farmers of the district.

Q. Do the farmers object to the man having so much land?

A. Not in the least in the district where it has been the custom for many years, because they know they can get men to do their work when the work needs doing.

Q. Are you of opinion that small plots of about 20 rods can be of any real service to working men and give them satisfaction?

A. Decidedly. There are at least 5,000 of such plots around Nottingham alone, and so greatly are they valued that if such an impossible thing were to happen as a movement for dispossession it would lead to a provincial revolution.

Q. Can you say what crops are chiefly grown on these plots?

A. It may fairly be said that in one or the other of them everything may be seen in its season that is pleasant to the eye and good for food—flowers of various kinds, fruit trees and bushes in thousands, and vegetables of the best varieties and the highest quality. The gardens are much cherished, and so are thousands of others still smaller in various parts of the country.

Q. What is a fair price to pay for land in allotments?

A. You may as well ask me what is a fair price to pay for a watch. I have one I would rather sell for 10*s.* than another for 10*l.*; and I would much sooner pay at the rate of 5*l.* an acre for the best land than 10*s.* for the poverty-stricken and inferior.

Q. Do you think that increasing the number of small cultivators will increase the wage-rate of workers on the land?

A. I do not; because it has not done so in parishes where the land has been largely tilled by small cultivators for generations. Where men are content to remain by earning a little in addition to their wages the numbers are apt to increase; where they are not they diminish, and scarcity in anything raises its value, abundance having a contrary tendency. It is not, however, within my province to answer questions of a controversial nature connected with the acquirement and value of land, and I ask that they may be limited to points of cultivation and management during our course of lectures.

LECTURE II

THE SOIL: ITS NATURE, PREPARATION, AND IMPROVEMENT.

In dealing with soils we go to the root of the whole question of cultivation, but how few who work on the land know its origin and nature! It is essential to know (1) what soil is, (2) how it is made, (3) the purpose it serves, (4) what it does for the tiller.

1. **What Soil is.**—Soil is a mixture of mineral products and animal and vegetable remains, forming and collecting from remote ages until now. The earth is always changing, its products always growing, always decaying, the death of what is gone giving the means of life to what exists, and for plants, men, and animals yet to come. It is nature's great store-house of food to meet the wants of the world.

2. **How Soil is Made.**—It is made by the crumbling of rocks under the action of rain, air, and frost. The process is plainly seen in old stone pits and railway cuttings.

Without dipping deeply into the science of Geology it may be well to explain that soils are grouped in two great divisions—inorganic and organic. These are familiar terms, but there are even many gardeners who do not comprehend their significance. We will try and make the matter plain.

Soils made from the crumbling of rocks alone and composed chiefly of silica (sandy), alumina (clayey), magnesia, potash, soda and iron—all minerals—are "inorganic," because they are not composed of something that once lived, or of the remains of plants and animals. Soils that *are* composed of such remains—of something that once had organs of life, something in fact that once grew, then died and crumbled to mould as do fallen leaves, decaying vegetation and animal refuse, are "organic."

It is well to know these things, and the benefits derived by mixing soils and adding manures will be the more readily comprehended.

Soils composed of mineral matter chiefly—inorganic—contain elements that give firmness and substance to growth; for instance, without silica the stems of wheat and other grain crops would be soft and fall over, as is the case in black peaty and bog soils in fens, which are mainly of vegetable origin. Without potash and lime, derived from rocks, we could not have full crops of the best potatoes; without phosphoric acid and potash we could not have superior cabbages or turnips; while carrots could not be perfect without soda, nor parsnips without lime; and as will be subsequently explained, it is by providing the mineral and non-mineral essentials for crops in the right proportions that the best results are obtained.

We now turn to vegetable soil. It is this that gives richness to the earth and force to growth. When soil is new—first formed by crushed and powdered rock, it is necessarily bare, but does not long remain so. The seeds of weeds and spores of mosses settle on it, and with requisite moisture soon germinate and cover the surface with plants which grow and die, leaving behind them a film of dark

mould; others follow and run their course, and the soil if not in a position to be washed away is gradually deepened year by year. The mass thus formed naturally will be dark in colour and soft in texture—vegetable mould pure and simple.

This alone is not sufficient to support useful crops, for to use a common expression, there is not "bone enough in it"; but in due proportion soil so produced (organic) is of enormous value, and indeed without it useful food crops could not be produced. This accumulation of decayed vegetable matter is known as "humus," and within certain limits the greater the amount of this incorporated with soil of a mineral origin, the greater is the fertility of the whole.

Farmyard manure is good for land that does not contain sufficient vegetable matter, because it supplies humus, and yet plants and crops do not feed on this. It is not food, but a producer of food and warmth. Dark soils are warmer than those light in colour because of the humus they contain, and land containing a large proportion of vegetable matter does not dry out in summer to nearly the same extent as do soils that are comparatively destitute of it, because humus has an affinity for moisture.

Sandy soils, clayey soils, and marly soils are all benefited by humus or material such as stable manure and vegetable refuse that produce it; but black, soapy soils have enough or too much of such matter, and need lime, with other mineral applications, to increase their fertility, as will be pointed out subsequently.

3. **The Purpose Soil Serves.**—The main purposes of the soil are two-fold. First to afford anchorage to the roots of trees and secure them in their positions; and secondly, to hold the requisite materials for supporting growth.

You may be told here that plants do not feed on soil any more than bees feed on flowers. Bees take the honey and leave the flowers, and crops take what is honey to them out of the soil—food—and leave the vessel—the earth—that contains it.

It is the duty of the cultivator to render the soil fit for receiving and *holding* food for crops, and here comes the question of good management in mixing and working.

The mixing of soils is often a matter of very great importance. Take the two extremes, the two bases, of soil, sand as the drier and freer; clay as the heavier and more adhesive.

Neither pure clay alone nor pure sand alone is capable of supporting growth. We may see plants or crops growing in what appears to be sand in one place or clay in another, but that is because they are not pure, but really mixed, and therefore contain some at least of the elements of fertility.

The best of soil is loam, and loam is composed of sand and clay in differing proportions. Take, say, 100 ounces of any given soil and thoroughly diffuse it in a cistern or tub of water. In a few minutes the sand will fall to the bottom but the clay will remain suspended. If the water be now run off and evaporated by boiling, the clay may then be compared with the sand.

If the sand is present to the extent of over eighty per cent. it is a sandy soil. If from sixty to eighty a sandy loam, if from forty to fifty a typical loam; if from twenty to forty a clayey loam, and if there is less than twenty per cent. of sand the soil is called clay.

Soil to serve its purposes well must be deeply stirred and well pulverized. It must admit air yet hold moisture. If too porous it cannot retain moisture—

ood—and heavier material must be added to increase ts retentiveness ; if waterlogged it is poisoned, because ir is excluded.

Sandy soil must be made more retentive of moisture y the addition of a heavier medium or it cannot hold utriment for crops to feed on, and the virtues of anure slip away. Clay, or very strong soil, dried nd smashed into small particles, is admirable for im-roving the texture of light sandy or brashy land, nd far better than applying the clay in raw lumps. Vet soils must be drained or the manure added to hem will be wasted, for it cannot be used in the bsence of warmth and air.

Draining Land.—Wet land is cold because the un's rays are employed, not in warming the soil, but n evaporating the water. If a pint of water is eva-orated from 100 lbs. of soil the land is left ten egrees colder than it would be if the water passed way by filtration. When the earth is full of water is practically sealed against air ; when the water asses away it gives place to air, fifteen pounds of hich presses on every square inch of surface. It s feared that too many cultivators fail to appreciate he value of warm moist air in the soil. It is not only aluable but immeasurably the most important of all gents in promoting growth. Is it necessary to say ore on the paramount importance of aiding the es-ape of water by filtration from land through which does not sink freely in a natural manner? When does so pass away artificial drainage is super-ious.

Then thought must be exercised in digging and epening land. "Dig deep to find the gold," may a golden maxim, but to prove its truth the rk must be done intelligently. There are three ntinctly recognized methods of working the land,

(1) Ploughing, (2) Digging, (3) Trenching, and right and wrong methods of procedure in each case.

Practical teaching on these subjects, can be better conveyed by the aid of a few simple engravings than in many words without them.

In Fig. 2 (below) we have representations of ploughing five or six inches deep, on the left side; digging, a foot deep, central; and trenching two feet deep on the right hand side of the illustration. In

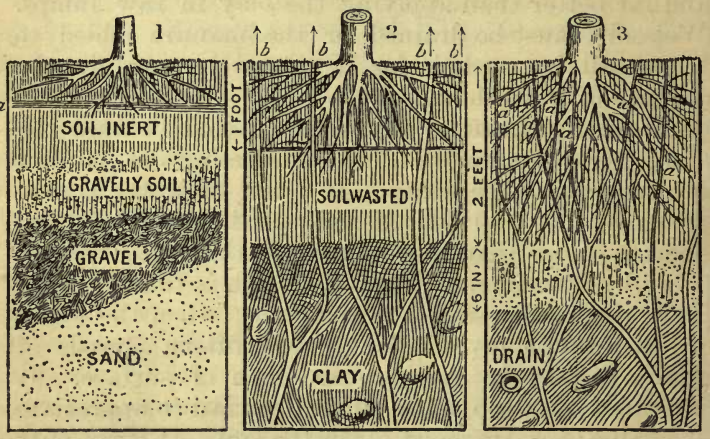

FIG. 2.—SHALLOW AND DEEP WORKING.
1. Ploughing. 2. Digging. 3. Trenching.

each case the relative differences in growth are indicated by the character of the roots of the trees and the varying thicknesses of the stems.

Where the soil is shallow and a hard sole (*a* 1) formed, the roots are of necessity confined to a very small feeding ground, while if the soil is irony a deposit may accumulate on the sole and be injurious. In any event, the roots cannot penetrate the hard medium, neither can the moisture of the lower strata of the earth pass freely upwards to them in summer,

for supporting growth that languishes by the want of it in dry weather; nor, on the other hand, can an excess, as during continuous rains, pass freely downwards. Thus the roots of trees and crops may at one period be "standing in water," while at another they may be searching in vain for the moisture they imperatively need, and all through the want of knowledge or intelligent labour. By this thin working of land, amenable to deep culture, only a small portion of the soil is utilized, while a much greater bulk is wasted.

By spade culture (2) the depth of good food-holding soil is increased, and the (until then) practically useless under layer reduced in bulk. This is a distinct gain, because the food store is doubled, tree growth extends, and crop growth, of vegetables or flowers, increases correspondingly when cultivators do their duty.

Digging, then, is an advance on ploughing, and trenching (3) rightly conducted, an advance on digging. The right hand side of the figure makes this clear. The soil is made good to the depth of two feet —not only well broken up to that depth, but stored with fertility, or, in other words, the food store is enlarged and adequately furnished with the essentials for tree and plant growth. The result of this is root extension and ramification, and just as is the character of the growth—roots—within the ground, so is that of the parts above ground—stems and branches. If the roots are cramped or starved, the growth of trees and crops is stunted and the produce poor; but with free and healthy root action in fertile soil the growth is free and the produce abundant, so far as it can be made so by the aid of the cultivator.

Much land that is systematically worked by the plough can be improved by the subsoiler following

in each furrow, smashing up the hard and then inert subsoil as deeply as possible, and leaving it in position. This is imperative to most, if not all, soils that are to support fruit trees and bushes. The air, rain, and manurial virtues permeate the hitherto almost impervious subsoil, and it is gradually improved as a rooting medium for the crops.

In digging a small unlevel plot the workman should commence at the lowest part by opening a trench there and wheeling the soil to the highest, where he should finish. No matter whether his trench is straight or curved, that is the easiest and best method of levelling the ground. A broad open trench should always be kept and every spit of soil taken clean out and turned over in its new position. There must be no "shuffling" or rolling it over in a half-closed trench.

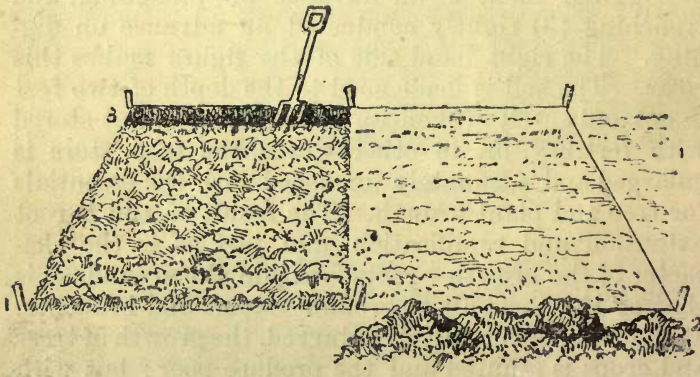

FIG. 3.—DIGGING.

In digging a large level plot labour is saved by marking it through the centre, or in cross sections, and digging up one side and down the other, as shown in

the engraving, Fig. 3. First take out a trench a foot wide and deep across the end (1) and place the soil along the edge of the opposite half (2), then dig to the other end (1 to 3), filling the open trench there with soil from across the end (4), working backwards, and completing the work by filling the last trench with the soil first removed (2). Some good workers break up the bottom of each trench with the fork before it is filled in with the next section turned over; the practice is generally commendable, and often highly advantageous.

Trenching means moving the whole of the soil to the depth of two feet or more: but if this had not been done before, the subsoil having remained unmoved, it may be for generations, it would be most unwise to bring it from its position and place the top soil at the bottom of each trench. That is the common practice of untaught or inexperienced workers on the land, who have often worse than wasted their labour. No crops can grow in a foot in thickness of sour subsoil which is made to form the surface soil by the erroneous practice indicated.

The right process is shown in Figure 4, page 36. A1—A2—a plan of the piece of ground to be trenched. Stretch a line from 1 to 2 and make a nick along the surface with the spade, dividing the space into halves. Then remove the soil two spades wide and one spade deep at 3 and 4 from B to C, placing it in a heap D. Next remove the subsoil 5 which was under 3, placing it in a heap E, and A1 will be ready for trenching as follows:—

Dig the lower subsoil 6 a spit deep and leave it at the bottom, then turn over the upper subsoil 7 upon 6, next dig the lower subsoil 8, then turn over the surface soil 9 upon the subsoil 5. Repeat the process till the end of A1 is reached at F, and there will be

spaces left precisely like 3, 4, 5 : fill these spaces with the soil and subsoil taken from G, then go on trenching A2, and when H is reached finish off the work with the subsoil E and the upper soil D. It will be obvious that by placing this near H there is true economy in time and labour over the old practice of taking the trench out right across one end of the plot and conveying the soil, it may be a long distance, to the opposite end for filling in the last trench.

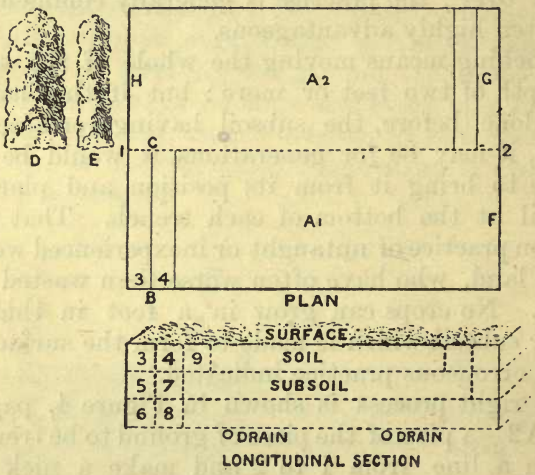

FIG. 4.—TRENCHING GROUND.

By the method of trenching advised the best and most workable soil is practically kept at the top with the subsoil remaining below it. There is naturally a little mixing as the work goes on and it is good, also enough in the first instance. The sub-soil steadily and surely improves, and the more quickly if rough manure, leaves, or soft vegetable matter with lime be spread on it before covering with the surface soil.

The second time the plot is trenched after cropping a good portion of the under spit may be mixed with the upper soil; and at the third trenching the whole may be suitable for blending, and the plot then, with manurial additions, should be capable of affording maximum yields. Soil of good staple brought into the best possible condition by deep culture and enrichment gives a much greater profit to the tillers, who pay at the rate of considerably more than £5 an acre in market gardens, than they could possibly obtain from weak, thin land with "nothing in it" if they paid only 5*s.* or 10*s.* or indeed no rent at all.

Most strong soils are greatly improved by rough digging in the autumn, exposing the lumps to the action of frost, which shatters them. Then by further action in the spring, when the soil is somewhat dry, it may be smashed into small particles. Figure 5 (page 38) shows soil thrown up roughly before winter in the upper example (1); below it is the state of the soil after frost (2); and still lower is its condition when levelled down in spring for cropping (3), the first essential to success being then provided—a good tilth.

Manure containing much straw is good for mixing with *strong* soil in the autumn, as also is gritty matter such as road sweepings, ashes, peat moss litter, leaves, and even sawdust—anything to open it and render it more friable; but gritty additions would not be equally good for very *porous or sandy soils:* nor would autumn exposure by digging, this being best left till early spring, while the earth is still moist, not deferring it till dry weather in late spring, or much moisture, which it is so desirable to retain in soils that "dry out" quickly, will be dissipated to the detriment of the crops in summer.

Moisture is constantly being drawn out of the earth to the air by the action of the sun. This is known as

capillary attraction. But the cultivator may keep much of it in the soil by maintaining a loose surface, or mulching. Turn again to Fig. 2, page 32. In the trenching section (3) the capillary tubes (*a*) are closed by a loose

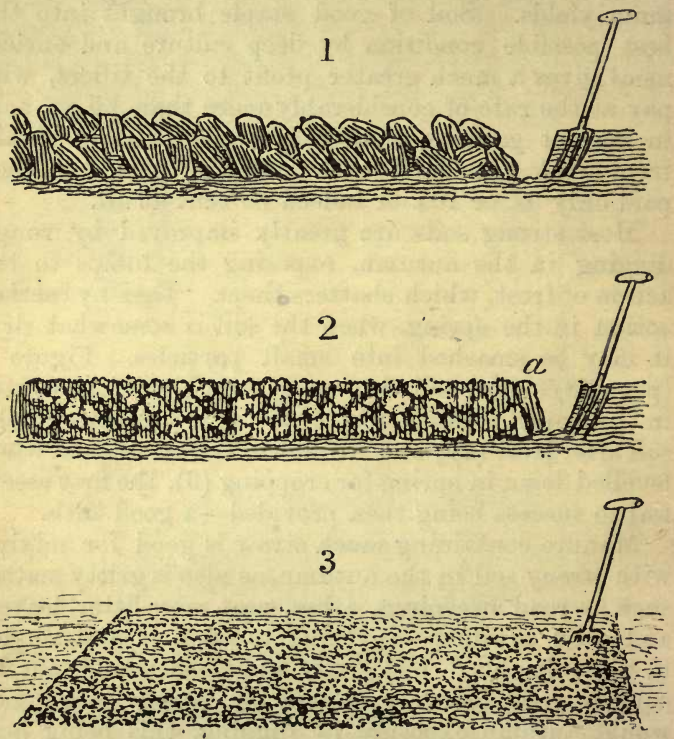

FIG. 5.—SOIL AMELIORATION.

or mulched surface; in the digging section (*b*) no such precautions are taken; the surface is left unmoved, shrinkage following, with the consequent cracks and fissures through which the moisture escapes (as indi-

cated by arrows), that is so urgently needed by trees, plants, and crops in dry weather. This is a matter of so much importance that it will be referred to again; in the meantime it is hoped that information has been imparted that will be of service to many in the management of their gardens or allotments.

4. **What does Soil do for the Tiller?**—This may be answered in a sentence. It depends on what the tiller does for the soil. He must regard it as a larder for containing food for crops. It must be sweet by the action of air and it must be clean. If the larder is bare—the soil poor—crops languish; if the land is foul with weeds, when useful crops are growing, they steal the food which should support those crops. Waste (*loss*) is the penalty of soil exhaustion; an abundant yield (*profit*) the reward of high cultivation.

QUESTIONS AND ANSWERS

Q. Can you give an idea as to how we may know whether land needs draining or not?

A. Certain weeds afford guidance; for instance, if rushes grow freely drainage is undoubtedly required and will do great good.

Q. But if there are no rushes how are we to know whether there is too much water in the land or not?

A. Dig a hole or pit here and there three feet deep in the autumn, pile the soil round it and lay a board across to keep rain or surface water out; then if water collect and stand for any length of time drainage is needed.

Q. What depth of water should we take to guide us in th matter and how deep should drains be laid?

A. If the water does not rise to within two feet of the surface, most kinds of vegetables may be grown very well; but for fruit culture it should not stand within three feet of the surface, and pipe drains should be laid, very firmly and evenly, three and a half feet deep to prevent its doing so. When pipes are

properly laid in rows about six yards apart, and have a gentle fall and free outlet, the water cannot rise above them and the soil then will not be stagnated.

Q. In what way do crops show the want of drainage ?

A. They are late in starting into growth because the sun cannot warm the soil ; warm air cannot pass through soil that is stagnant with water because the air is lighter than water, just as oil is, and therefore floats on the surface. Moreover the growth in saturated soil is not only slow and stubborn but essentially unhealthy, for the simple reason that wholesome plant food cannot be obtained from such soil. Any person can test the matter for himself by an experiment with plants in pots. Stop up the drainage of one or two and continue watering them the same as others which are properly drained ; the difference in health will soon be apparent ; in fact there can be no healthy growth in a quagmire—except of bog plants—whether the saturated soil is in pots or not. Land resting on gravel as in Fig. 2 (page 32) is naturally drained, but water-holding clays should have drains "placed in" them.

Q. Is strong clayey land as much improved by deep trenching as light land is ?

A. No, a foot of strong soil will by its natural retentiveness *hold* twice the plant food that the same depth of light land will. The chief thing is to make heavy land workable by the addition of gritty matter to open it, breaking up the bottom of the trenches as the digging proceeds but leaving the freest soil at the top for sowing or planting in. Light land should have heavier particles mixed with it as advised in the lecture.

Q. In a light land district and no heavy soil to be found for mixing, what would be the best course to pursue for obtaining the best results ?

A. The land, after being covered with a green crop in winter (see page 19), should be dug early in the spring a good spade depth, and the bottom of each trench also well broken up but the soil left in position ; then any soft annual weeds or vegetable refuse may be spread on it, and covered with the top soil from the next trench. If manure is applied in the autumn much of its virtue is washed out of sandy land in winter. As the crops in such soil are liable to suffer from drought, digging in dry weather in late spring should as far as possible be avoided ; and if the ground is light it should be compressed by treading before sowing or planting. Manure if scarce should not be dug into sandy land deeply. It is better to work some of a decayed kind just within the surface so that the roots of crops may immediately benefit by it ; and it is an excellent plan to spread

manure on the ground between the plants as its virtues are washed down by the rains, while the covering prevents the escape of the moisture by evaporation, that is so much needed in such ground by all kinds of crops in summer. If not covered, or "mulched" as gardeners call it, though the ground be firm below, a loose surface should be maintained by running the hoe through it frequently, as an inch or two of loose sand or dust-like soil aids materially in keeping moisture in the earth.

Q. You say the manure should be kept near and even on the surface when the soil is of a dry sandy character; but if it were buried deeply would not the roots find it?

A. They would find the solid matter that was dug in, but in the meantime much of its fertility would be washed down into the subsoil and there vanish. If placed near the surface it would be washed down *to* the roots and not away *from* them; still if manure is plentiful use it freely in and through the soil to the depth of a foot or more, but reserve some for the surface of light porous land in which crops suffer from drought.

Q. Is there one time more suitable than another for trenching?

A. Yes; autumn or early winter, for more of the ground is devoid of crops then, and heavy work can be best done in cool weather. Strong soil then becomes sweetened and pulverised ready for cropping in the spring.

Q. Please name a good inexpensive book on soils.

A. Dr. Fream's work, *Soils and their Properties* (Bell) is packed with valuable information.

LECTURE III

RAISING PLANTS, CROPS, AND TREES

From the earliest times the raising of crops, plants, and trees from seed, also by cuttings and layers, as well as increasing trees by budding and grafting, has been carefully and successfully practised. Yet in these modern days and with schools everywhere, the great majority of persons who work on the land know little or nothing about at least some of these operations.

The subject of raising new plants from seed is full of interest, and the process of fertilisation, or inoculation as it is often termed, for the production of new and distinct varieties, is to many mysterious.

The Seed and its Germination.—Every plant raised from seed is absolutely a new plant, the plant in embryo was in the seed, just as a chicken must be in the egg before it can hatch ; and as the egg affords nourishment for the chick before its escape from the shell, so does the seed contain nourishment for the embryo plant until it produces roots and gathers food for itself. It is important that both eggs and seeds should be good, whether used as food or for purposes of reproduction. A thin, weak, ill-fed seed cannot produce a robust plant. The seed must be well stored with starchy matter. It is a mistake therefore to eat

all the finest pods of beans and peas, and save only the thin and weak for sowing. By saving the seeds in an unusually fine pod of peas and beans, sowing them, and selecting the best from these again, improved varieties of great value have been established. This is called improvement by selection, and is within the power of any man to effect. It is not improvement by fertilisation, which is a more delicate process, but attainable by steady hands guided by thoughtful heads.

Germination is the first growth of seeds, and is worthy of careful study, because when the process is well understood, and the necessary conditions are comprehended and provided, failures are not likely to occur. The seeds, we have said, must be good. Some are in the best condition the first year, such as peas, beans, carrots, onions, and parsnips, and though older seed may grow, it is not to be trusted. New seeds are not absolutely essential of the cabbage family, including turnips, as fine well-harvested samples remain good for half a dozen years or more.

The chief requisites for seed germination are soil-warmth and moisture, with oxygen gas from the air. In the absence of any of these essentials there can be no growth. Some seeds if buried too deeply may have sufficient moisture, but that is of no service if they are sealed from the air; others may have air in abundance, but if they are too near the surface, or on it, may lack moisture, and therefore remain inert. The amount of heat required varies for different kinds, but some warmth is essential for all.

Seeds germinate best in the dark, and if small seeds are sown on, not in the soil, and this is constantly moist, and no light reaches them, they grow freely; but they would not do half so well in full light, even if they had warmth and moisture.

Heat is evolved in the process of germination, as

may be seen or rather felt in malting barley; and this also shows how important good seed is. When the seed is plump and well ripened, containing abundant starch, this, when the seed swells, and the young plant is hatching so to say, is converted into sugary matter for its nourishment; but if the barley is imperfect it contains little or no starch but a kind of gum, and the heat, air, and moisture convert this not into sugar, but vinegar, and the seed decays instead of sprouting. That is exactly what occurs with seed in the ground when it is in the same faulty condition.

In sowing seeds, then, they must be covered to exclude light, be deep enough to find moisture, but not too deep to prevent air reaching them. Warm moist air is exactly what they need.

In preparing for sowing too much care cannot be taken in making the soil free—providing a good tilth. The finer the soil and loose on the surface, not beaten hard and smooth, the better is the moisture retained in it for the seed. If flattened down when wet, it shrinks in drying and fissures form, and out of these the moisture rushes, taking heat with it, for there can be no evaporation without a loss of heat.

A small sketch will be elucidatory on this subject. In the *left side* of Fig. 6 we have at the top an even drill in well-prepared soil, and even growth from the seed; below it we have steady progress of the plants, and at the bottom free root action and a good crop, the surface having been kept loose by frequent hoeings and the escape of earth moisture by evaporation prevented. On the right side we have, at the top, an uneven drill in cloddy soil and irregular growth from the seed; below it we have slow progress in the plants, and at the bottom arrested root action and a poor crop, the earth moisture that should

have supported the plants during the summer having been allowed to escape into the air through the fissures in the surface which might have been prevented. Free, well-worked soil for sowing in is a prime essential in germination, while the frequent use of the hoe between the rows of crops in spring and early summer is undoubtedly one of the cheapest and best

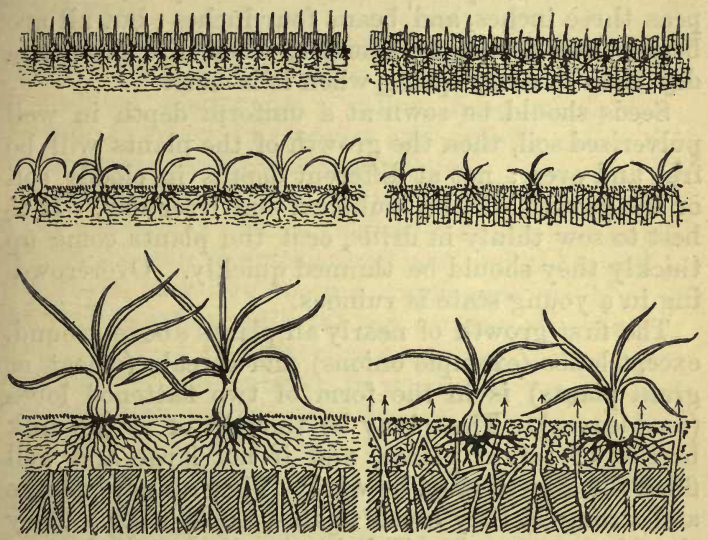

FIG. 6.—GOOD AND BAD TILTH, WITH RESULTS.

methods for promoting growth. The left side of the figure represents good management in three stages; the opposite side faulty methods. Do not forget the lesson.

The depth at which seeds should be sown depends mainly on their size. Small seeds are often covered too deeply, indeed placed in their graves, because, if they germinate, the first tender growth (plumule)

cannot force its way through. Large seeds such as peas and beans are frequently sown too near the surface, where the moisture is insufficient for their germination, as they need more than the small kinds.

As a rule small seeds, such as cabbage, turnips, and others of a similar size, may be covered about half an inch deep. Onion, carrot, parsnip, and radish seeds about an inch, spinach and beet nearly two inches, peas three inches, and beans four inches; but all are better sown deeper in summer, when the ground is dry, than in early spring when it is moist.

Seeds should be sown at a uniform depth in well pulverized soil, then the growth of the plants will be free and even; not at different depths in cloddy soil or the growth will be stubborn and irregular. It is best to sow thinly in drills, or if the plants come up thickly they should be thinned quickly. Overcrowding in a young state is ruinous.

The first growth of nearly all plants above ground, except bulbs (example onions) and cereals (wheat or grain plants) is in the form of two flattened lobes (seed-leaves). These may be thought of as the milk bottles of infant plants, and if not large and well filled the growth must be weak. They cannot be large and strong if they crush against each other. They should never touch. This is a small matter of great importance that ought not to be overlooked. Too thick sowing and too late thinning spoils many crops.

Cuttings.—It has been said that plants raised from seed are new or distinct individualities; those raised from cuttings are not, but merely an extension of the parents, possessing precisely the same habits and having exactly the same cultural needs.

When cuttings are taken from greenhouse and window plants in full growth in summer, as most of them should be, before flower buds form, then inserted

in damp sandy soil, and exposed to the sun and air, they do not take up moisture through the cut ends so fast as it escapes from the leaves, therefore these droop, wither, fall, and the cuttings die.

But if quickly made and inserted in similar soil, and a tumbler or bell-glass is pressed down over them and shaded from the sun, the escape of moisture from the leaves is prevented; these then remain fresh and roots form.

The production of roots is formed by the sinking of the sap, this collecting at the base and forming a lip or cushion, known as a callus, from which roots protrude. When this occurs and growth starts the young plants must have sun and air.

Cuttings of fruit trees and bushes are best inserted in the autumn as soon as the leaves can be shaken off, because the sap is descending then, and the earth is still warm, therefore rooting commences quickly; if the work is deferred till the sap commences rising in spring most of the cuttings may die. Young firm wood made in the summer, in some cases with a heel of the old wood, is the right kind to choose.

The ends of all cuttings should be made quite smooth close under a joint with a sharp knife, as a clean wound heals quickly, a jagged wound slowly.

How cuttings of bush fruits are made and inserted is shown in Fig. 7, page 48.

On the left side all the buds are cut clean out of the cutting except four at the top for forming the branches, then with proper pruning we eventually have a clean-stemmed fruitful bush as shown. On the opposite side the cutting is inserted with all the buds on the stem from which sucker growths may issue, as indicated by the lines. The result of this is a confusion of growths as shown in the miniature plant below, and which cannot be converted into a

satisfactory fruitful bush by any amount of after pruning. The cross marks are points of shortening for increasing the number of branches, as foreshadowed by the dotted lines, but the suckers spoil the bush or tree and might have been easily prevented.

Budding.—Every good well-matured growth bud, not blossom bud, on a tree contains the rudiments of

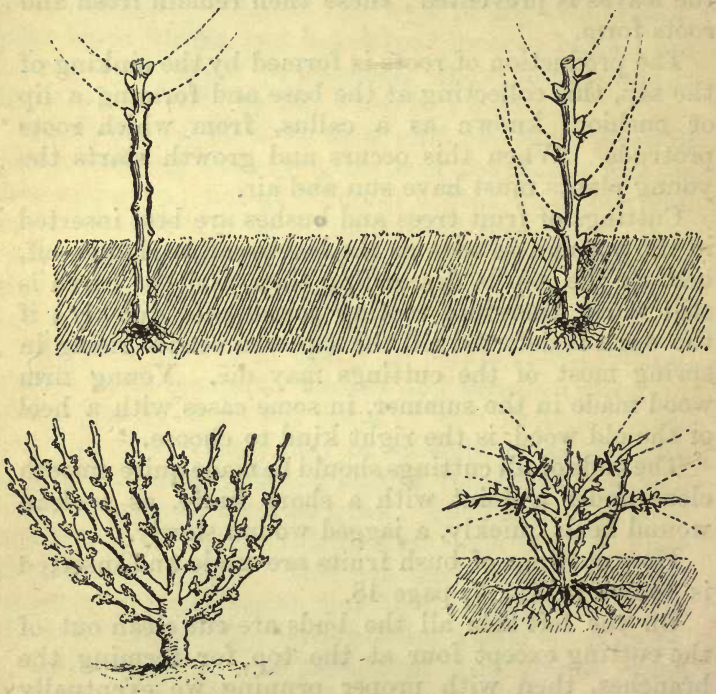

FIG. 7.—PREPARING AND INSERTING CUTTINGS WITH RESULTING GROWTH.

a plant, or tree, of like kind; and a bud can be transplanted so to say from one tree into another of a different variety, but of the same species or kind, and it will grow. Thus rose buds inserted in briars will

grow, but they would not grow in any plant differing in its nature from a rose.

Young crab trees are changed into apples by budding, but the apple buds would not grow in the plum, nor plum buds in a pear or any such mixture.

Budding must be done after midsummer, in July or August, when trees are in full growth, the buds well formed, and the sap active.

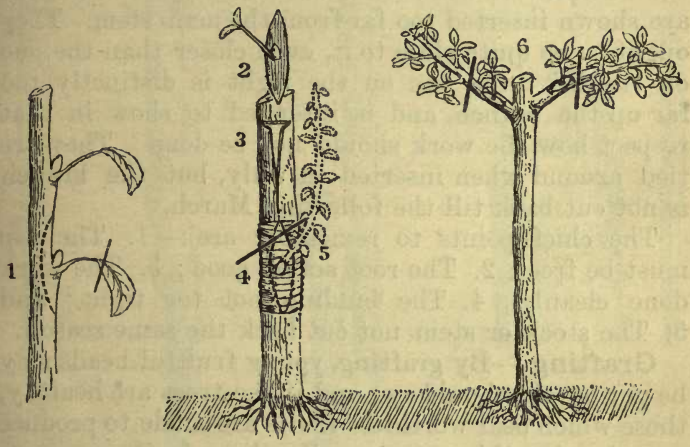

FIG. 8.—BUDDING FRUIT TREES AND ROSES.

It must be done quickly before the sap of either the bud or the stock evaporates and leaves the surfaces dry. If this occurs the buds usually die, but if the work is properly done at the right time more than ninety out of a hundred grow. Millions of trees are raised by budding every year much in the same way as is represented in the illustration.

References to the sketches are (1) Taking the bud out of a summer shoot. (2) The shield after the wood behind it has been taken out. (3) The slit in

the stock just through the bark. (4) The bud inserted in the slit and kept in position with soft ligatures. (5) The growth from the bud in spring, after the stock has been cut down at the mark across it. In that way a young crab stock may be converted into an apple, or a quince into a pear. The stock is shown cut down, to economise space, but the top ought to be left intact when the bud is inserted and not cut back till the spring. (6) Shows how briar stocks are converted into roses; but the buds are shown inserted too far from the main stem. They ought to be quite close to it, even closer than the one on the left; the one on the right is distinctly too far up the branch, and is intended to show in that respect how the work should not be done. They are tied around when inserted in July, but the branch is not cut back till the following March.

The chief points to remember are:—1. The sap must be free; 2. The root action good; 3. The work done cleanly; 4. The binding not too tight; and 5. The stock or stem not cut back the same season.

Grafting.—By grafting, young fruitful heads may be put on old shoulders; and if the trees are healthy, those which bear worthless fruits are made to produce superior by this process. Seedling fruit trees are generally worthless, and should be grafted when young with good well-known sorts. It is much the best plan however to buy young trees, and to improve old by grafting.

The work of grafting must be done in the spring when the sap is rising; but it is very important that the grafts, known as scions, be taken off before the buds swell, and kept fresh in moist earth.

There are different methods of grafting, two both simple and useful being shown in the illustrations, Fig. 9.

After the grafts are tied in they must be covered with a plaster of clay and horse manure two or three inches thick, and if any cracks appear in drying they must be promptly smoothed over to exclude air. Or grafting wax much less thickly applied may be used. It may be made of equal parts of yellow wax and

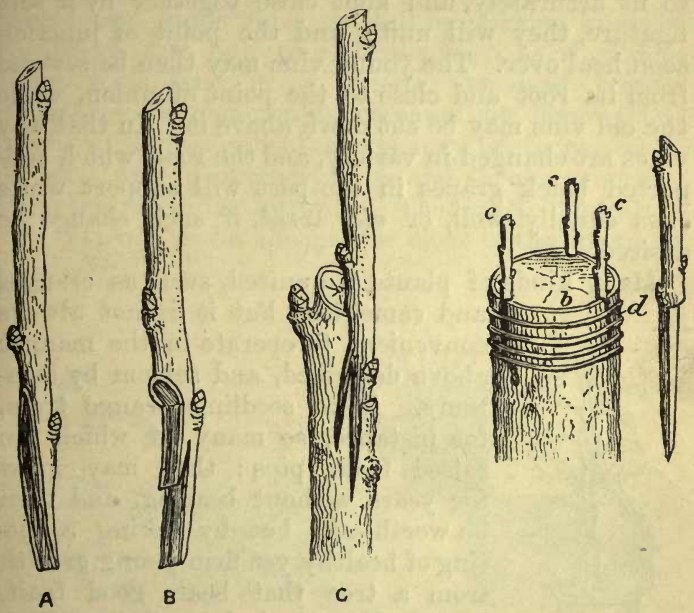

FIG. 9.—GRAFTING YOUNG STOCK AND OLD TREES.

References.—A. The graft or scion. B. Tongued for insertion. C. Affixed to the stock or young tree. The sketch on the right is a large tree or branch *b*. *c* shows the scions inserted in slits between the bark and the wood after being prepared as shown at *d*.

turpentine, adding Burgundy pitch equal to half the quantity of wax, and mutton suet equal to half the quantity of pitch. Melt the whole, mix thoroughly, and when cool form into soft balls for use.

Inarching is allied to grafting. The difference

is in the branch attached being supported by its parent till the union is effected. If a young vine in a pot is stood by an old one planted out, and a slice six inches long or thereabouts be taken from the young vine in spring, and also a corresponding slice from the old one, and the cut parts are made to fit accurately, and kept close together by a soft ligature, they will unite, and the point of junction soon heal over. The young vine may then be severed from its root and close to the point of union, while the old vine may be cut down above it. In that way vines are changed in variety, and the roots which supported black grapes in the past will support white ones equally well, or *vice versâ*, if such change be desired.

Many kinds of plants are united, such as oranges and camellias; but it is not always convenient to operate in the manner above described, and seldom by amateurs. Take seedling orange trees, for instance, so many of which are raised from pips; they may grow for years without bearing, and then be worthless; but by taking a cutting of healthy yet firm young growth from a tree that bears good fruit, it can be attached to the seedling by inserting one end in a bottle of water, slicing and splicing the top as previously advised, and as shown in Fig. 10. The water supports the cutting till it is united with the plant, then this is cut down to the point of union, and the end of the cutting trimmed off close to the stem, the fruitless or worthless tree being made fruitful by the process. Vines can be successfully "worked"

FIG. 10.—BOTTLE GRAFTING.

in precisely the same way, which is known as bottle grafting.

Layering.—Nearly all kinds of trees and shrubs, also many plants, will root if young branches or shoots are bent down, notched or tongued, and pegged in moist soil. Fruit trees can be raised in that way if needed, also grape vines, as well as various kinds of evergreens and flowering shrubs, such as rhododendrons, roses, and many others. Amongst flowers carnations are commonly increased by layers; but others with procumbent stems may be increased in the same way in summer, trees and shrubs generally being layered in the autumn. The small illustration (Fig. 11) will make the matter clear to the inexperienced.

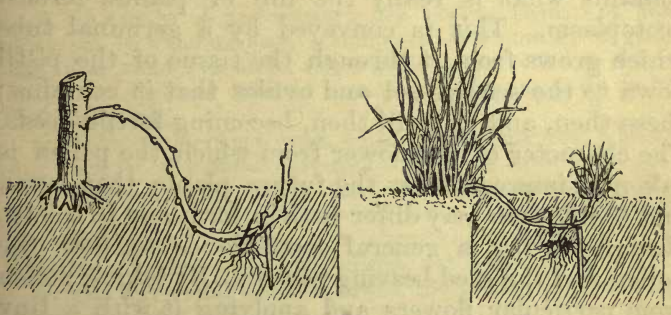

FIG. 11.—LAYERING TREES AND PLANTS.

Fertilisation.—We now turn for a few moments to the interesting subject alluded to at the commencement of this lecture, for describing briefly the process of fertilisation, or crossing, to obtain new varieties of flowers, fruit, or vegetables.

It may be said at the outset that perfectly double flowers do not produce seed, and cannot be made to do so, because the essential floral organs, pistil and

stamens, have been changed into petals. Nor can single flowers produce fertile seed in the absence of pollen influence.

Pollen is popularly known as flower dust. It may often be seen blowing like a cloud over a wheat-field in July. In flowers it is particularly apparent in liliums and fuchsias. It forms in the anthers. When ripe it is shed and borne by the wind, bees or insects, to the pistils of other flowers. This is termed natural fertilisation. The pistil is the central tongue-like organ, easily recognizable. It is connected with a hollow vessel at its base (ovary). The tip (stigma) in the flowers named is swollen, and at a certain stage moist. This moisture causes the pollen to adhere. Each pollen grain is a cell, and contains what is really the life of plants, termed protoplasm. This is conveyed by a germinal tube which grows from it through the tissue of the pistil down to the seed-vessel and ovules that it contains; these then, and not till then, becoming fertile seeds. The character of the flower from which the pollen is taken is impressed on the future plants that issue, and the flowers may differ both in form and in colour, though having a general resemblance to both the pollen and the seed-bearing parents. By taking pollen from particular flowers and applying it with a tiny brush to others that are selected, new and beautiful flowers are raised and different colours obtained. This is called artificial fertilisation. The best-shaped flowers are usually chosen for producing seed, dependence being placed on the pollen for producing a change of colour in the flowers of the seedlings.

It should be remembered, however, that only the same kinds of flowers intercross through pollen agency, such as two fuchsias, two liliums, or two geraniums. If these differ in form or in colour, then

others diverse from both are secured; and with judgment in selection and skill in manipulation varieties are greatly improved; but there can be no union between a lilium and a dahlia, nor a fuchsia and a geranium, or any other totally distinct families of plants. It will be perceived that in this interesting work the intelligent hybridizer becomes an originator of new plants and flowers, thus adding to the beauty of a beautiful world.

QUESTIONS AND ANSWERS

Q. Are we to understand that the grains of flower dust are like seeds, but seeds only grow in the soil while pollen grains grow on flowers?

A. It can be so understood; the pollen, farina, or flower dust, call it what we may, is composed of a number of grains, and these when seen under the microscope are found to differ in shape and size from different flowers, the same as seeds do from different plants.

Q. Is there any cheap work with illustrations from which we can learn more on this interesting subject?

A. Certainly. Sir Joseph Hooker's Primer on Botany can be had for a shilling through any bookseller. It is published by Macmillan's, and tells far more about the matter than I can state here, for these are horticultural not botanical lectures.

Q. Has any useful result followed the raising of new plants by the process of fertilisation?

A. "Useful results!" It is safe to say it has resulted in improving families of plants, in some instances to the extent of a revolution, and many thousands of pounds have been realised by the sale of such plants. All the gorgeous tuberous begonias are the outcome of this process, as are the finest varieties of other kinds of flowers, hardy and tender, as well as many varieties of vegetables and fruits.

Q. Passing to another subject; can you tell us anything more about what you referred to as "improvement by selection," and if new varieties have been obtained in that way?

A. New forms of both vegetables and flowers of great value have been obtained by taking advantage of what may seem

accidental productions, fixing and increasing them. For instance, the fine peas Duke of Albany, Prince of Wales, and some others, were procured by selecting an unusually fine pod that appeared on older varieties, and sowing the seeds. The increase in size and character of the original pods was maintained in the progeny and thus large stocks were raised. The excellent pea Telephone was secured by picking some light wrinkled seeds from the rounder and darker seeds of the variety Telegraph, and probably brought Messrs. Carter and Co. many hundreds of pounds. Some of the finest beans have been established by selection. The red Beauty of Hebron potato produced a white tuber. It was saved, planted, and gave a crop like itself, and now white Hebrons are becoming plentiful, and have been sold for higher prices than the red. And so we might go on enumerating ; but the practical point to remember is to choose the finest samples of everything for seed, for that practice leads to improvement, while eating the best and saving the worst for growing is followed by degeneration.

Q. May flowers be improved in the same way ?

A. Undoubtedly ; and if care were not exercised in saving seed from the best only, the stocks would soon deteriorate. Then many new flowers, chrysanthemums especially and some roses, have been obtained from what are known as "sports." A branch pushes and produces a flower quite different in colour from the remainder. This branch is rooted by layering or as a cutting, the peculiarity being retained and eventually plants obtained and multiplied.

Q. Speaking about saving seeds, did you not make a mistake in saying that double flowers do not produce seed ?

A. No, I think not. Some flowers appear double when they are only partially so, and the essential organs, pistil and stamens, remain, seeds following. Without these organs there can be no seed, and it is only when they are changed into petals that a flower is strictly double.

Q. What then about roses, hollyhocks, wallflowers and chrysanthemums, surely they are double enough, yet they form seed ?

A. No, they are not "double enough," except in appearance and for beauty ; the organs of fructification are present, though more or less hidden among the petals, but can in most cases be easily found by searching. It may be said, however, that a chrysanthemum bloom is composed of a number of flowers nestling at the base of the florets ; these inconspicuous flowers alone produce seed, the more attractive parts being mere appendages, mainly developed by cultivation. A chrysanthe-

mum, then, is not a double flower, but rather a number of flowers crowded together, and it is the same in the case of asters, daisies, dahlias, and all apparently double flowers that are known as composites, and grouped by botanists under the natural order *Compositæ*. It is repeated, therefore, that perfectly double flowers do not produce seeds.

Q. A question or two on raising fruit trees and bushes, please. Cannot they be raised from seeds?

A. Certainly; but seedlings are long in coming into bearing, and after all the waiting not one in fifty may be equal to the parent, while the majority will not be worth the ground they occupy. It is far better to bud or graft them as advised in the lecture. The best fruit trees are, however, prepared by nursery men, and it is really cheaper for amateurs to buy trees that commence bearing soon after they are planted, than to raise their own and wait several years for fruit.

LECTURE IV

THE FOOD OF CROPS—MANURING THE SOIL

To use manures aright with due attention to economy and efficiency, it is essential that we have a thorough knowledge of soils, such as was imparted in the second lecture. You were there specially invited to regard soil as a medium for conveying sustenance to crops, a storehouse of fertility, a compound substance to be kept charged with the essential elements of plant food and never to be suffered to become exhausted of such elements.

The evils of soil exhaustion are to be met with almost everywhere. We see them in the barren old fruit trees of our orchards, in the stunted growth of our bush fruits, in inferior crops of vegetables, all asking for the sustenance we so foolishly deny them.

Plant Food.—Let us now see what food plants need. It was once thought that the indispensable elements to apply were nitrogen, phosphorus, potash, sulphur, calcium (the metallic base of lime), magnesia and iron, which are found in plants. But careful experiments extending over several years have proved that, generally speaking, the last four substances may be disregarded, and that for all ordinary purposes nitrogen, phosphorous, and potash in fair proportion form a sufficient manure, as in the example of potatoes

(Fig. 12), the other ingredients being usually present in the soil in the requisite quantities for supporting crops. The only exception is lime, to the use of which attention will be called presently.

The result of both proper and inadequate feeding is represented in the small photographic illustrations of potatoes, as obtained in Professor Wagner's experiments. The plant A (with its crop) is the result of

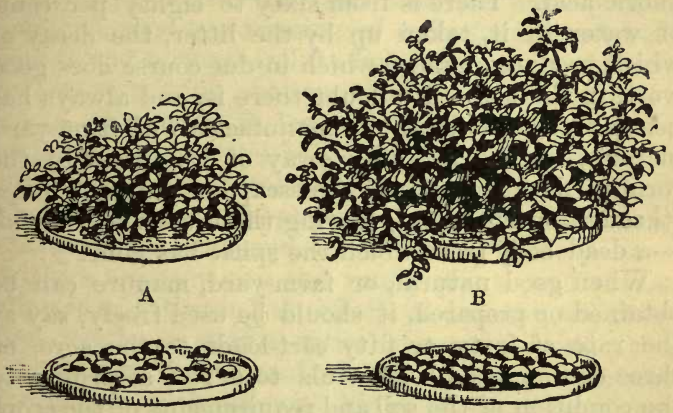

FIG. 12.—RESULTS OF FAULTY AND ADEQUATE MANURING.

growing in poor soil, though containing some phosphoric acid and potash as applied in bone-meal and kainit, but no nitrogen. B shows the result of supplementing the potassic and phosphatic manures with nitrogen applied as nitrate of soda, the addition of this giving a three or four fold increase by, so to say, bringing the other two into action. Not any one of them alone would be satisfactory, but all must be in combination.

Natural or Farm-yard Manure.—Under this term is included the refuse from horse and cow stables,

also piggeries. This kind of manure is taken first as being more generally used than any other, because more accessible to the majority of cultivators. It is also a safe form of manure, and when good, contains those elements of plant food which our experiments have shown to be indispensable.

A ton of farm-yard manure should contain at least nine to fifteen pounds of nitrogen, nine to fifteen pounds of potash, and four to nine pounds of phosphoric acid. There is from sixty to eighty per cent. of water in it, taken up by the litter, the decay of which produces humus, which in due course does good work in the soil. No doubt there is, and always has been, much waste in the manufacture of farm-yard manure, by the draining away of its juices in the form of dark liquid, and the escape of pungent gases (through overheating), leaving the heap a mere husk —a dead body from which the spirit has gone.

When good natural, or farm-yard, manure can be obtained or prepared, it should be used freely, say at the rate of forty or fifty cart-loads to the acre, or three or four good barrowfuls to a rod, according to the condition of the soil and requirements of the crops to be grown.

Compost Heaps.—All animal and vegetable refuse, including leaves of various kinds, soft weeds piled in a heap, whitened with lime, covered with soil and moistened with soap-suds, dish washings, and bedroom slops, thrown on frequently, decays and becomes a store of rich food for crops. If turned over a few times and sprinkled with soot, the heap will be increased in value, while if covered with soil, after throwing waste liquid refuse over it occasionally, the mass will not be in the least offensive. When decayed and friable the compost is good for digging into the ground for all crops, and for sprinkling on the surface

soil over the roots of fruit trees and bushes. Refuse heaps thus prepared are of great service in gardens.

Peat Moss as Manure.—An excellent form of manure is now to be had in most large towns where peat moss litter is used for bedding horses. It is largely employed for this purpose. It comes saturated with urine and mixed with horse droppings, and is as frequently used for top dressings as for working into the soil.

Nothing can be better than this for fruit plantations. A good top dressing of such manure attracts roots to the surface, and its rich juices enter the soil with every passing shower. No spade should enter such a plantation to lacerate and destroy the roots, the feeders of tree and bush.

In the culture of root crops such as turnips, as well as celery and green crops generally, farm-yard manure is invariably recommended as affording sustenance—enriched moisture—to the young plant, and so enabling it to withstand the effects of drought, which so often does harm at this critical stage of growth.

Artificial or Chemical Manures.—Important experiments with different kinds of these fertilizers have been carried on for a long time in various parts of the country. The Sussex Association for the improvement of Agriculture, under the guidance of Professor Jamieson, proved to demonstration how unnecessary was the application of sulphur, calcium, magnesia and iron there as manure. The omission of phosphorus, or of nitrogen, gave the same blank results as when all seven forms of manure were omitted; the omission of potash did not similarly stop growth, though it resulted in small, unhealthy plants; but the omission of sulphur, of magnesia and even of lime, had no lowering effect upon the crop. Subsequent analyses of turnips grown without the

addition of these last three elements to the soil, showed the presence of lime and magnesia in the roots, proving that the land naturally contained them.

It may be stated as a rule that the most economical form of nitrogen for use as a manure is nitrate of soda, though sulphate of ammonia runs it closely, and the popular belief that these splendid fertilizers tend to impoverish the soil is now pretty well exploded. With a combined application of nitrogen,

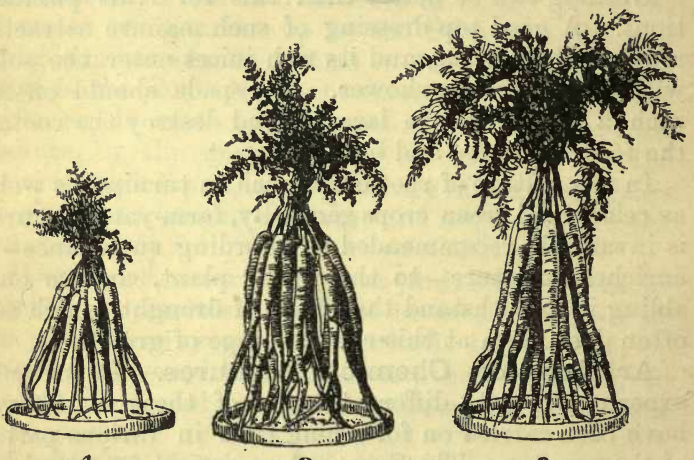

FIG. 13.—THE GOOD EFFECT OF NITROGEN.

1. Grown with phosphoric acid and potash, as in bone-meal and kainit. 2. With nitrogen in addition, as in a small dressing of nitrate of soda. 3. The result of a full dressing of this fertiliser in combination with the others. (Wagner.)

potash and phosphates, in adequate proportions, the soil is well stored with food for crops and plants, or, in other words, rightly manured.

It is inattention to the addition of mineral manures that has given rise to the idea that nitrogen, either conveyed as nitrate of soda or sulphate of ammonia, exhausts or scourges the land. That

is not so, but on the contrary proper applications of those essentials feed the land. Crops exhaust the soil—deprive it of its minerals—only when nitrate of soda or sulphate of ammonia are applied alone and continuously.

Taking nitrate of soda as our nitrogenous manure, we add to it muriate of potash, steamed bone flour and mineral superphosphate, or Thomas's phosphate powder, to form a satisfactory manure. The proportion differs somewhat according to the crops, but for an acre of land we may safely take $1\frac{1}{2}$ cwt. nitrate of soda, $1\frac{1}{2}$ cwt. mineral superphosphate, or Thomas's phosphate, $\frac{1}{2}$ cwt. of muriate of potash, $\frac{1}{2}$ cwt. steamed bone flour. This mixture may be given at the rate of 2 ozs. to the square yard, 4 lbs. to a rod of land, or 5 to 6 cwt. per acre, but half as much more may be given to poor soil.

It may be said that muriate of potash contains 41·9 per cent. of potash, and is therefore richer in that element than is kainit, which varies from 9 to 14 per cent. of potash. Yet kainit is cheaper, and has often answered equally well. Potash is not washed out of land by rain, the soil holding it most tenaciously, but nitrate of soda is much quicker in action and fleeting, therefore best applied to growing crops in spring. It is of benefit to all, though least of all to peas, beans, and other pod bearing plants.

Steamed bone flour is obtained from bones which have been subjected to steam, at high pressure, for the extraction of glue or gelatine. The residue contains from 56 to 65 per cent. phosphates, and from 1 to 2 per cent ammonia. It is white, friable, and can be crushed with the hand. It is ground to a fine flour and is the active form of bone manure.

Mineral superphosphate is ground coprolite treated with sulphuric acid. Coprolite is antediluvian

petrified manure, of which there are large beds in the eastern counties. It is fairly active, yet sustaining.

Thomas's phosphate powder, or basic slag, is produced in the conversion of cast iron into steel by what is known as the Bessemer or "basic process." It is composed of 15 to 25 per cent. of phosphoric acid and about 45 per cent. of lime. It is not very quick in action but lasting in effect, and may be of good service in fruit culture.

It was at one time confidently asserted that chemical manures were of very little value for light soils, but that idea is exploded along with many others which had no foundation in fact.

In a moist whitish sand, described as chemically barren, by the use of chemical manures alone, a crop of 29 tons 17 cwts of swedes was obtained, and in the following year there was a crop of turnips weighing 30 tons 7 cwts. per acre ; while peas were remarkable for their productiveness.

The practical deduction from these noteworthy results is that the quality of soil depends upon its mechanical state—friability—as well as upon its chemical composition.

Liming Soils.—A friable state of the soil, or suitable consistency, is always desirable, and it is to promote that, as well as to incite wholesome chemical action, that we apply lime to heavy dense clayey soil. This is done profitably at intervals of about five years, and the average quantity used is about 65 bushels per acre, or nearly half a bushel to a rod. The lime should be brought to the land in lumps fresh from the kiln, placed in small heaps covered with a few inches of soil, then, when slaked, spread on the land and at once worked in, though not deeply. This may be done early in spring, a few weeks before sowing or planting.

The effect of lime upon soils may thus be described: It unites with felspar or clay, setting free potash or other alkalies; it acts on vegetable matter, setting free ammonia, water, nitric acid, and carbonic acid, tending to destroy excess of humus (clogged or pent up manure); and it neutralizes organic acids, thus sweetening the soil, and is a plant food in itself.

As a rule lime should only be applied to land containing much clay or humus—black soapy soil—and when applied it should at once be covered with earth, from its tendency when brought into contact with nitrogenous manures to set free ammonia. It does not benefit poor land unless this is of a peaty nature. A dressing of lime to old gardens over-abounding in humus (vegetable matter), and therefore often sour and inert, is highly advantageous if due care be taken to cover the lime with soil.

Chemical manures prove most beneficial when applied early in the year, before active growth begins. In fruit culture two dressings answer best, one in February and another during the swelling of the fruit. In both instances the manure is more speedy and certain in action if applied in a liquid form, or as a top dressing in showery weather.

Never forget that throughout the season of growth, crops, whether of fruit or vegetables, make incessant demands upon the soil for the nourishment stored by us in it. It is our duty, as it is undoubtedly to our interest, to see that these stores do not become exhausted. "Replenish," is what the whole economy of plant life and soil culture is constantly saying to us, and our response must be prompt.

Manuring by Green Crops.—Special attention has been drawn by agricultural chemists to the fact of all leguminous or pod-bearing plants, such as vetches, clover, lupines, lucerne, peas and beans, obtain-

ing ample supplies of nitrogen, which originally comes from the air, so that the only manures required by such crops are potash and phosphoric acid as contained in kainit and bone meal, or Thomas's phosphate powder, nitrate of soda having little effect on them.

FIG. 14.—THE SMALL EFFECT OF NITROGEN ON BEANS.

1. Receiving phosphoric acid and potash, no nitrogen. 2. Small increase only through adding nitrate of soda. (Wagner.)

Liquid Manure.—It is hardly possible to deal fully with manures in a single lecture, but liquid manure must not be passed without some notice, however brief. For the villa and cottage garden, household sewage should always be turned to account for growing crops in spring and summer, and for fruit trees and bushes in autumn and winter. If only the soil drainage is sound it may be poured over the surface with certainty that good is being done. Waste

none of it, and when any can be spared give it to the fruit trees copiously, if they are weakly or stunted in growth.

For vegetables in full growth liquid manure may be used twice a week; for younger crops once a week will suffice. Whenever it is used there must be no mere surface wetting, but a thorough soaking of the soil. This should be done in the evening to prevent excessive evaporation.

In strawberry culture exceptionally fine fruit is a certainty if liquid manure is given once or twice a week, from the time the flower trusses are visible up to the colouring of the fruit.

Never give liquid manure to the soil when it is quite dry, or much of it will be wasted. It is only when the soil is moist that the roots can imbibe its virtues, therefore it is often of great advantage in summer to first soak the ground with pure water, to "swell" the soil, and render it more absorbent, then follow a few hours afterwards with the more nourishing liquid fare.

Than manuring the soil rationally—intelligently,—no work on the earth can be more important, and none more deserving of the most thoughtful attention, for the more we consider the subject the more convinced shall we be that the source of wealth and the necessities of life will, and must, be found in the food of crops.

ANSWERS TO QUESTIONS.

In order to save space the questions are not published with this lecture. Advice on applying manure to strong land was given in Lecture II., pp. 40 and 41. The answers given on special manures, their uses and application, are arranged under numbers as follows:—

1. SUPERPHOSPHATE OF LIME AND NITRATE OF SODA.—Two parts of the former and one of the latter make an excellent

mixture for all kinds of green crops (except peas, beans, and clover), as well as for strawberries, fruit bushes, and trees that need extra support. Apply in early spring at the rate of about 2 ozs. per square yard; 4 lbs. per square rod (30¼ yards); 1¼ cwt. per rood (¼ acre); 5 cwt. per acre. This is a full dressing, and less may be used in good soil. If growth is not satisfactory, follow in a month with a half dressing of nitrate of soda (½ oz. per square yard).

2. Superphosphate of Lime and Kainit.—Take 3 parts (or pounds) superphosphate and 1 part kainit, mix well and apply as advised above. It is excellent for potatoes, scattering a handful in a length of 8 yards of trench when planting, and is good also for peas, beans, and clover.

3. Nitrate of Soda.—The best spring and summer dressing for light soil when potato and other crops are just starting into growth to stimulate them. For cold heavy land, sulphate of ammonia is perhaps better (nitrate of soda lowering the temperature). Rate to apply: the half dressing as advised in No. 1 mixture. N.B.—Nitrate of soda should not be used *alone* year after year: it is more a stimulant than a durable food of crops.

4. Common Salt.—Useful for all such crops as cabbages, winter greens, turnips, mangolds, and wheat, especially in dry soils, applied in spring, at the rate advised for No. 1. It is not required near the sea.

5. Soot.—This is an excellent manure because rich in salts of ammonia, and it also contains salts of potash and soda, as well as sulphate of lime. Soot is used extensively and profitably for onions in Bedfordshire, and is good for all root and green crops. It is sown at the rate of 40 to 60 bushels per acre, or 1 peck to 1½ peck per rod. It should not be applied with lime or the ammonia will be dissipated.

6. Poultry Manure.—This mixed with six times its bulk of perfectly dry soil, and kept in a dry place, is excellent as a top-dressing for fruit trees, vegetables, and flowers.

7. Ammonia-fixed Guano.—Guaranteed to contain not less than 8 per cent. of ammonia and 20 per cent. of phosphates, this is one of the best dressings for crops generally, applied in early spring as advised for No. 1, and repeated in a few weeks if the land is poor.

8. Proprietary Manures.—Many of these are sold by nurserymen and seedsmen. They are necessarily more costly than obtaining the leading kinds separately and mixing. These, however, are not always easy to procure in small quantities. Specially blended manures such as Thomson's, Cannell's,

Carter's, Webb's, Jensen's, Albert's and others are active, and small quantities suffice, as indicated in the directions accompanying them. Their influence may be seen in Fig. 15. The larger fuchsia in the illustration was stimulated by Albert's horticultural manure, and taken from their manual obtained from 17, Gracechurch Street, E.C.

9. MIXTURE FOR PASTURE AND GRAIN CROPS.—Apply at the end of February to pasture, sow with spring corn, and top dress winter corn. Rate per rood (¼ acre): ¼ cwt. of nitrate of soda, ¼ cwt. of superphosphate, 14 lbs. of kainit, 14 lbs. of steamed bone flour: to be mixed two or three days before using.

10. LIQUID MANURE.—The drainings of manure heaps contain the "spirit" of the bulk, and to allow this to run to waste

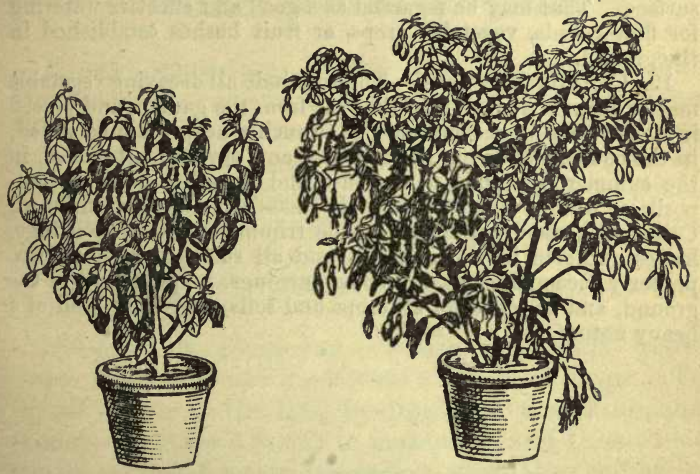

FIG. 15.—THE EFFECT OF MANURE ON FLOWERS

1. Grown in ordinary soil. 2. Dressed with Albert's nutritive mixture.

is tantamount to throwing away tea, coffee, and beer, then saving for use the exhausted leaves, grounds, and grains. Either throw the juice from manure over the heaps or apply direct to the land. Household sewage (including urine) diluted with five or six parts of water, is excellent for fruit trees and all growing crops. Other liquid manure is made by mixing

(1) 1 lb. of guano, or (2) 1 lb. of superphosphate and ½ lb. nitrate of soda, in 20 gallons of water; or (3) half a peck of soot, or a peck of poultry, pigeon, or animal manure, in 30 gallons of water. No manures act so quickly as those in a liquid state. Those named are for garden use, and would be too strong by half for plants in pots.

11. WATERING.—Evening is the best time for watering the ground in hot weather. Daily sprinklings on sunny mornings do more harm than good, as the evaporation then quickly following abstracts warmth from the soil; one copious weekly watering of crops in the open ground in the evening is much more effectual —a supply equal to nearly an inch of rain; this is 23,000 gallons per acre. An easily remembered equivalent is half a gallon to the square foot, or four and a half gallons to the square yard of surface. That may be regarded as a good and effective watering for flower beds, vegetable crops, or fruit bushes established in the ground.

12. COMMON MANURES.—These include all decaying vegetable matter accumulated during the year from the garden, and placed in a neat heap to decompose. If to such a heap there be added, in the course of turning it, some soot and sewage matter, also, in the summer, soapsuds with house and chamber slops, decomposition will be hastened and the mass considerably enriched. Collected horse-droppings, roadside trimmings, ditch scourings, leaves gathered in the autumn, and all such common things, properly decomposed by occasional turnings, help to fertilize the ground, and are good for all crops and soils, especially land of a heavy nature.

LECTURE V

ENEMIES OF CROPS AND TREES

Every occupation in life has its impediments. Obstacles of various kinds obstruct free progress. What may be termed the law of opposition pervades all nature, and its influence extends everywhere. It is certainly felt in gardens and fields. Weeds fight with crops for the mastery, in appropriating the virtues of the soil, while insects above ground and grubs within it, are ever in combat with the cultivator.

Weeds as Enemies.—While men wait weeds grow, and these are inveterate enemies of crops. To invest labour in the land by digging or trenching, and money or money's worth in manuring, and then to let weeds take and retain possession when they might be prevented is deplorable.

It is not only the mineral support of crops, or what may be termed their solid food, that weeds steal; they devour the liquids also, the rains and all the rich nourishment for plants, which the drops collect in their passage through the air. Depriving the earth of its life-giving moisture and the food it contains is often a very serious matter, and in dry poor soils positively ruinous.

The loss of wealth in the form of food-producing matter that is extracted from the soil every year in this kingdom by weeds would, if it could be ascertained, startle by its immensity. No one ought to have more land than he can feed well and keep clean.

Enemies of Fruit Trees and Bushes.—These are manifold. They comprise birds, beetles, grubs, caterpillars and insects. Of the birds the Bullfinch is the most destructive, a few pairs of these being sufficient to render the trees in a garden practically fruitless by destroying the buds. It is not the best to shoot these birds, and especially in fruit trees, as the shot does much injury to the branches. By far the best plan is to secure the birds alive with a trap-cage and call-bird. They sell readily, and one fruit grower has made £25 of those he caught in his garden.

Sparrows do good at one time in gathering insects for their young, and much injury at another in destroying fruit buds, especially on gooseberry bushes. When too numerous, becoming a pest, as is the case in some localities, sparrows must be thinned.

The buds may, however, be preserved by dressing trees and bushes in winter, or after pruning, with a wash composed of sulphur, lime, and salt.

Take quicklime 5 lbs., sulphur 10 lbs., water 10 gallons. Boil these for half an hour, keeping stirred, then slake $7\frac{1}{2}$ lbs. of quicklime, and dissolve $7\frac{1}{2}$ lbs. of common salt in boiling water, adding thereto the lime and sulphur mixture, and enough water to make 30 gallons. Strain through a hair sieve, and syringe or spray on the trees. When the work is well done, birds do not take the buds.

When trees are encrusted with moss, this harbours many insects, and the incrustation is also injurious.

To make a winter wash for cleansing them: Dissolve $\frac{1}{2}$ lb. each of caustic soda and commercial potash in 5 gallons of boiling water, and spray on as hot as the hand can be borne in it for ten seconds. This will clear off moss and insects, and make the branches bright and clean. So will freshly slaked lime, washing the large branches with a solution of it, and dashing powdered lime amongst the twigs and spurs when they are wet on a still, misty morning.

As a summer dressing for all kinds of insects: Dissolve $\frac{1}{2}$ lb. of caustic soda in a gallon of water, and in this boil $\frac{3}{4}$ lb. of sulphur till it is dissolved. Then dissolve 7 lbs. of soft soap in any convenient quantity of water, and mix the whole, boiling for a short time. The ingredients are sufficient for 30 gallons of insecticide, for applying warm with a syringe fitted with a spraying nozzle only.

When leaves have a reddish or scorched appearance they are infested on the underside with a mite, known as the red spider. It is so small as to be almost invisible, but is highly injurious.

The above mixture will destroy this and other insects, as well as most caterpillars that attack trees in summer, and do no damage to foliage or fruit.

Against the codlin moth grub that devours apples, and the winter moth caterpillar that ruins trees, Paris green is the remedy. It contains much arsenic, and is poisonous. It should be had in paste form. Mix from 2 to 4 ozs. in a little water, then stir into 40 gallons; or in small quantity, not more than $\frac{1}{4}$ oz. to 4 gallons. Apply when the buds swell in spring, again when the leaves unfold, and the fruit is set, then as often as small caterpillars may be seen. It should fall on the trees and leaves like mist and rest on like dew, not using so much as to run off them like rain.

The female winter moths are wingless, and creep up the stems in October to deposit eggs for hatching in the spring. Grease-proof paper bands smeared with sticky matter, such as resin and sweet oil, two-thirds of the former, melted, and one-third of the latter, wrapped round the stems before the middle of the month named, secure them on the way. Oily and tarry substances applied direct to the bark are injurious.

A golden rule in subduing pests and insects of all kinds is to attack them early, while they are still few in number, and a horde of pests may be prevented. They increase amazingly, and to wait till they are numerous is the very worst policy that can be adopted.

Grubs in Soil.—These are favoured by foul land, weeds and decaying vegetables. Everything useless should be promptly cleared off.

For most kinds of grubs, including wireworms, gas lime is one of the best-known remedies. If spread on land in the autumn 56lbs. may be used per rod (30¼ square yards), letting it remain six weeks or two months, then point it in, mixing evenly in the soil. If it is not applied till spring, and can only be on the surface about a week, 28 lbs. will be sufficient, and then seed sowing and planting should not be done immediately. This is good for land in which club root in plants of the cabbage family is prevalent. Salt is also good against wireworms, at the rate of 7 lbs. per rod applied in the autumn, mixing it in the soil by digging. Only half the quantity should be applied in spring.

Wireworms are the grubs or larvæ of a beetle (*Agriotes*), shown natural size and enlarged. They attack potatoes voraciously, and if tubers are placed in infested ground, or pieces of carrot with a stick

thrust through them for withdrawal at intervals of a day or two, numbers of the destructive grubs can be extracted by these baits.

As a spring dressing against slugs and small grubs, two parts, lbs. or cwts., of superphosphate of lime, and one part of nitrate of soda, applied at the rate of nearly 2 ozs. to the square yard, or 5 cwt. per acre is excellent, as it stimulates the growth of crops and checks the ravages of their enemies.

Soot may always be beneficially used for the same object; and clear lime water applied at night through

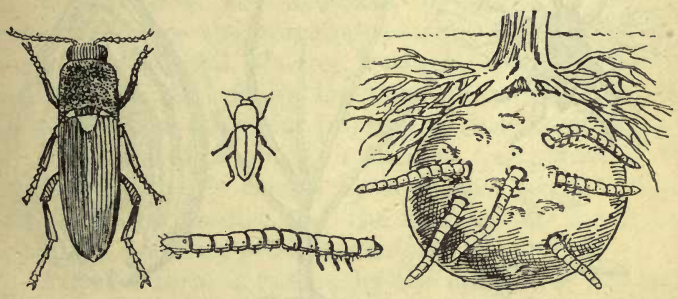

FIG. 16.—WIREWORMS.
Parent beetle, natural size and enlarged; larvæ attacking potato.

a rosed can, as if giving the crops a watering, destroys all the slugs that are drenched with it, and they are out feeding at that time.

Maggots.—These infest both the roots and leaves of plants, as in carrots, onions, celery, beet, and others. They are caused by small flies depositing eggs on the plants which hatch, and the larvæ—small worm-like creatures—enter the leaves and roots.

If in gleamy days in late spring and early summer small flies are seen hovering about the crops, it is an excellent plan to dew them with a solution of soft

soap, made by dissolving 2 or 3 ozs. of the soap in a gallon of water, then dusting with soot. This is distasteful to the flies. Half a wineglass of petroleum stirred in very briskly, also a decoction of quassia, made by boiling chips at the rate of 1 oz. to a gallon of water, render the mixture still more effectual, and it also acts as a manure. It may be applied once or twice a week in May and June or later.

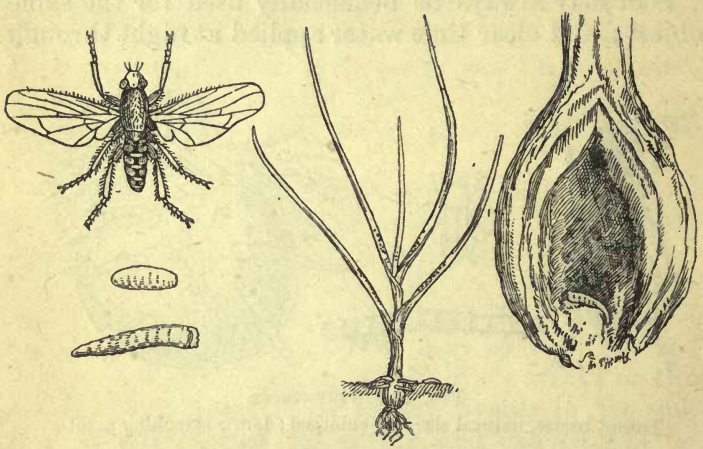

FIG. 17.—ONION (ANTHOMYIA) FLY MAGGOT.

Fly, maggot and pupa (enlarged) on the left; ruined onion on the right; attacked young plant in the centre (reduced) with eggs on the leaves and hatched maggots at the base.

Leaving carrots too long unthinned, then loosening the soil in drawing the plants out, afford the flies access to the roots. Thinning cannot be done too soon, and the soil should be made firm and smooth close round the plants remaining.

Fungus and Mildew.—These are great enemies of crops and fruit trees. The mildew on onions, turnips, peas, indeed on whatever it may be seen, is

caused by a number of parasitical plants which feed on the juices and ruin the crops. Even the active agents of canker in apple trees and gumming in plums are fungi, but the predisposing cause of attack is ill-fed and immature growth. The action of frost on this ruptures the tissues, and the enemy takes possession by its spores.

With healthy root action in soil which contains the nutriment that trees need, and the thin disposal of the branches, sound growth follows, and clean fruitful wood.

When trees are attacked by canker, pruning and cleansing the branches, cutting back roots that enter the subsoil, placing fresh, good soil in contact with them, and giving liquid manure freely are the best means to adopt for improving their condition.

One form of clubbing in turnips and plants of the cabbage tribe is caused by a fungus which attacks ill-nourished plants, and the free use of superphosphate of lime is a good preventive.

Another form is caused by the maggot of a weevil. Small warts on the stems of young cabbage plants should be cut off, and the roots dipped in a puddle of earth, soot, and petroleum before planting. Lime should be given unsparingly to the land, gas lime also as advised for maggots.

Under this category of enemies comes the terrible potato disease. The fungus (Phytophthora) roots, so to say, that is, spreads its mycelium through the tissues of the potato leaf (A to B, page 79), and the stem growths push through the breathing pores (C, E), for plants, like animals, could not live if they did not breathe. These stem growths of the fungus produce "fruit"-spores (D,D) in cells (Oogonia) that divide (F) and liberate the active agents in reproduction, tailed zoospores (G), which float in the air, and

swim in the moisture, dew, or rain, on potato leaves. They enter these through the pores, germinate, destroy the tissues, and set up the disease, which spreads, and has often ruined the crops. The fungus also produces what are known as resting spores. These, after much patient watching and waiting, were discovered under the microscope by Mr. Worthington G. Smith in 1875.

These may be called the eggs of the potato disease. How long they retain their vitality is not known. They wait for favourable conditions, then become active, and carry out their destructive work.

By placing these spores on the leaves of potatoes, and on slices of the tubers, they grew, as seeds grow under favourable conditions, and in that way the potato disease was cultivated at will. For this important discovery a gold medal was granted to Mr. Smith by the Royal Horticultural Society. He says the potato disease spores abound in old moist potato refuse in the course of decay, as in heaps with manure. It is prudent then to dry and burn all the potato tops possible, and so consume the eggs or spores of the murrain.

Other methods of preventing the potato disease are good drainage, deep culture, and wide planting, so as to produce stout plants with hard stems and thick leaves, coupled with a dressing of sulphate of copper and lime. This is applied both in water and as powder. It has been of service on the Continent against fungoid growths, and has been tried in many places in England, in some instances with marked success, rows to which it was applied being almost free from the disease, while others not dressed were a mass of blackness and decay. It is good also against mildew on various other crops.

In dealing with garden enemies, prevention is a

golden rule to follow. Absolute prevention of insect and fungoid attacks may not be possible, but it is

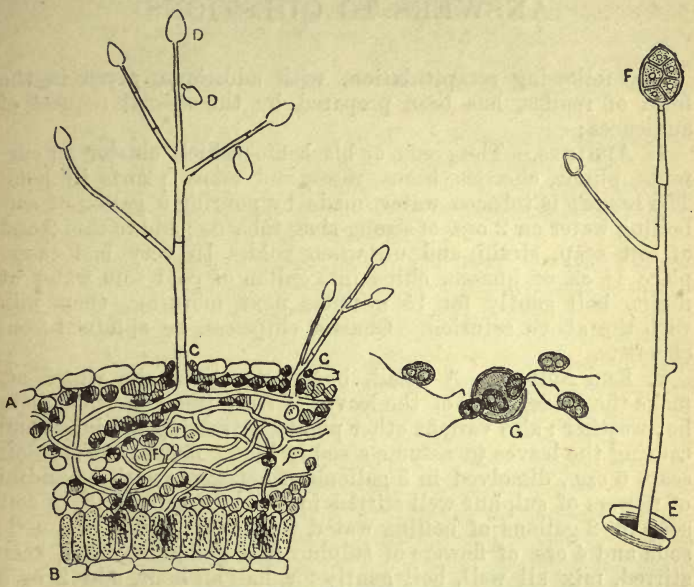

FIG. 18.—POTATO DISEASE FUNGUS (PHYTOPHTHORA).

A to B, tranverse section of potato leaf showing mycelium (spawn) of fungus. C, fungus growing through leaf. D, "fruiting." E, breathing pore in leaf F, conidia (spore cells) dividing. G, a cell enlarged 400 diameters, showing tailed zoospores emerging for spreading the disease. The figure on the left is taken from Griffiths' *Diseases of Crops* (Bell), those on the right (by W. G. Smith) from the *Journal of Horticulture*.

possible and practicable to prevent the enemy gathering in countless thousands and becoming a devastating horde. Waiting for plant enemies to multiply before resorting to repressive measures is a waste of time and material, plants and crops suffering in the meanwhile through the procrastination.

ANSWERS TO QUESTIONS

The following recapitulation, with additions, given in the form of replies, has been prepared by the special request of audiences :—

1. APHIDES.—The green or black flies which cluster on currants, plums, cherries, beans, roses, and many plants in pots. The *remedy* is tobacco water, made by pouring a gallon of soft boiling water on 2 ozs. of strong shag tobacco ; add to this 2 ozs. of soft soap, strain, and use when cold. In very bad cases, place 1½ oz. of quassia chips in a gallon of cold soft water at night, boil gently for 15 minutes next morning, then mix with the above solution. Quassia chips can be obtained from chemists.

2. RED SPIDER.—A small, but destructive mite which attacks the *under-sides* of the leaves of fruit trees and bushes in hot weather ; also various other plants, extracting the juices and causing the leaves to assume a sickly hue. *Remedies :* (1) Soft soap, 6 ozs., dissolved in 3 gallons of hot water with a handful of flowers of sulphur well stirred in. (2) Dissolve ½ lb. of soft soap in 2 gallons of boiling water, then boil 1½ oz. of caustic soda and 4 ozs. of flowers of sulphur in a gallon of water, keep stirred, mix all well, boil gently for half an hour, add 2 or 3 gallons of water, and the preparation will be ready for use. (3) Strong soapsuds, not containing bleaching powder. All are best applied in the evening. Water and liquid manure given to the roots increase the substance of the leaves, and enable them the better to resist the attacks of insects and mildew.

3. MILDEW.—Plants, trees, and crops infested appear as if covered with meal. This "meal" consists of living fungoid growths which feed on plants and destroy them. *Remedies :* The No. 1 advised for Red Spider ; also (2) Sulphide of potassium (from chemists), ¼ an ounce dissolved in a gallon of water. (3) Take 1 lb. each of flowers of sulphur and quicklime, slake the lime in a pan, add the sulphur and a gallon of water, mix well and boil gently for 20 minutes, keeping constantly stirred ; allow to settle, and when cool pour off the clear liquid and closely cork it in a stone bottle. For use, mix ¼ pint in 3 gallons of water and apply in the evening. (4) The potato disease antidotes (pp. 83, 84).

4. Scale Insects.—These encrust the stems and branches of fruit trees, and spread to the fruit, spoiling it. *Remedies:* (1) For winter use only. Dissolve ½ lb. each of caustic soda and commercial potash in 5 gallons of water. (2) Spirits of wine applied with a small brush at any time. (3) Dissolve 2 oz. of soft soap and a walnut-sized lump of washing soda in a gallon of water, stirring in briskly, while hot, half a wineglass of petroleum. Apply to the stems with a brush or syringe, in the evening.

5. American Blight.—The presence of these insects is indicated by fluffy masses of woolly matter on apple trees. They are highly destructive. *Remedies:* Brush into the affected parts only, in winter, a mixture of half soapsuds and half petroleum; in summer, use spirits of wine.

6. Fruit Tree Caterpillars.—The most destructive are those which hatch from the eggs of the winter moth, and eat the young leaves and blossoms in spring. The moths crawl up the stems in October and November, and are *prevented* by grease-proof paper bands tied tightly round, and smeared with cart grease and oil; or the mixture, page 74, but not applied to the bark. For destroying the caterpillars, Paris green, a preparation of arsenic, in *paste* form, dissolved at the rate of ¼ oz. to 5 gallons of water sprayed on the trees before blossoming, and again after the fruit is set, is the best *remedy*. It should rest on the leaves like dew, not run off like rain. It is a deadly poison.

7. Gooseberry Caterpillars.—*Remedy:* Dredge the bushes with hellebore powder when they are wet, and afterwards syringe with clear water, as the powder is poisonous. Pepper is also good. *Preventives:* Scrape 3 inches of soil from under the bushes in winter, and bury it deeply between them; scatter soot and lime under the bushes, and cover with fresh soil in place of the old removed. This prevents the emergence of the moths that deposit eggs from which the caterpillars hatch and devour the leaves. Fresh tanner's bark spread 3 inches thick on the ground in winter has the same effect, but is not always obtainable.

8. Maggots from the Eggs of small Flies.—These occur in the roots of onions and carrots. The eggs are deposited on the leaves and stems of onions in early summer, hatch, and the maggots enter the roots. The carrot fly attacks the tops of the roots through fissures in the soil. Maggots in the leaves of celery (Fig. 19 next page), beet, and parsnips, are caused by the leaves being punctured and eggs deposited in them. *Remedies:* The soft soap, soda and petroleum mixture in No. 4 for scale; also ammoniacal liquor from gasworks, ½ pint to a gallon of water sprinkled on in dull days in late spring and early summer when

the flies are hovering about the crops. These applications prevent the deposition of eggs and also act as manures. If the ground among onions is covered with brewers' hops or lawn mowings, the small maggots cannot travel through them to the plants. Early horn carrot seed sown early in July produces clean roots because the hatching period of the maggots has passed. For the same

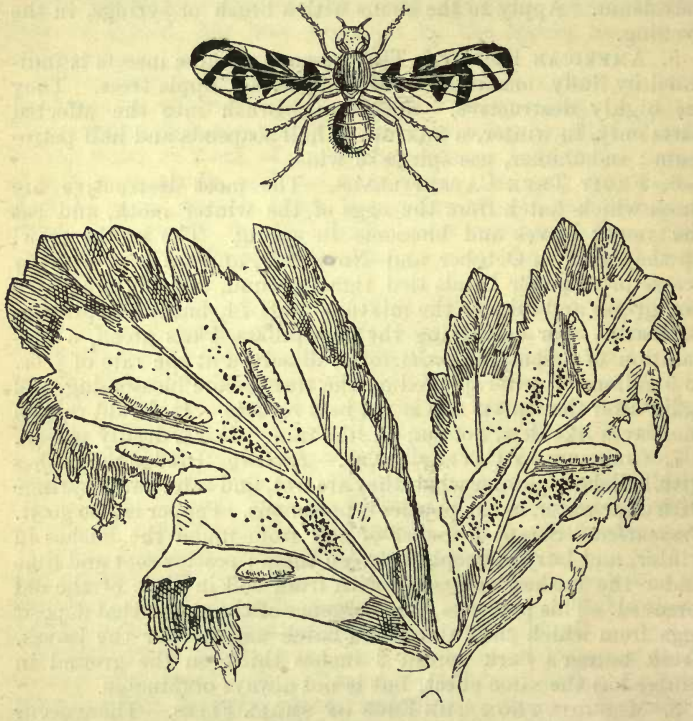

FIG. 19.—CELERY FLY (TEPHRITIS) AND MAGGOTS (ENLARGED) EATING OUT THE TISSUE OF THE LEAF.

reason autumn sown onions are usually free from maggots, while spring sown crops may be ruined by them.

9. SLUGS AND SNAILS.—*Remedies:* 1. Lime water. Pour water at the rate of 3 gallons to a pound of lime in lumps, as fresh from the kiln as possible, stir, then let stand and use the clear lime water through the perforated nozzle of a can, as if

giving the crops a good watering. This should be done an hour after dark, when the slugs are feeding; it will destroy all it reaches and do no harm to the crops. Day applications are of small service. 2. Dust the crops at night (after dark) with fresh lime, soot, or wood ashes, or all combined; these dressings destroy slugs and fertilise the ground.

10. WIREWORMS.—*Remedies:* 1. Spread fresh gas lime on bare land in the autumn at the rate of ½ cwt. per square rod, a ton per rood, or 4 tons per acre, to remain for 6 weeks, then well mix in the soil. If it cannot be applied before February, use about half the quantity and work it in a few days, or a fortnight before sowing or planting. 2. Salt, 7 lbs. per rod, two or three months before cropping. 3. Many wireworms may be caught by burying pieces of carrot, potatoes, or squares of fresh turf, with sticks thrust through them for withdrawal every two or three days. The idea that wireworms eat oil cake till they burst is a popular fallacy.

11. CLUB ROOT.—Crops of the cabbage tribe are often ruined by the roots clubbing and plants withering. One form is caused by the maggot of a fly; another, the most common, by the grub of a small beetle. Heavy applications of lime are beneficial, a bushel to each rod or plot 5½ yards square. It should be placed in heaps and covered with soil till the lime falls, then spread and worked in. Gas lime, used as advised in No. 10 for wireworms, has also proved of great service. Before planting examine the stems of the plants and remove all warts as these contain maggots, then dip the roots and stems in a mixture of soot, lime, and adhesive soil made into a puddle with soapsuds, to a gallon of which stir in a wineglassful of petroleum, and place wood ashes round the roots. Superphosphate of lime and nitrate of soda are good as maggot deterrents and fertilizers.

12. MOSS ON FRUIT TREES.—*Remedies:* The soda and potash mixture in No. 4, and dashing freshly slaked lime freely amongst the branches when dripping wet, as after a mist or fog. This also preserves the buds from birds, and the lime which falls to the ground is there beneficial.

13. THE POTATO DISEASE.—This, as has been stated, is caused by a fungus. Early potatoes escape the best, because they are, as a rule, ripe before the fungus spores are ready for distribution; and of later sorts, those with firm, upright stems and thick leaves. For preventing the disease, what is known as *Bordeaux mixture* has been found useful. It is made by dissolving 20 lbs. of powdered sulphate of copper in hot water, then adding cold water; the same quantity of freshly slaked lime is

then formed into lime-wash ; when the copper and lime solutions are both cold, not before, they are mixed together and enough water added to make 100 gallons. This is sufficient for an acre of potatoes. For a rood ($\frac{1}{4}$ acre) the quantities are copper 5 lbs., lime 5 lbs., water 25 gallons. The mixture should be pale blue in colour, if dark brown it has not been properly prepared. Apply three times through a fine sprayer (not a syringe) in the form of a dense mist to *cover* and *rest on* the foliage like dew, not washing it like rain. The first dressing is given in the last fortnight in June, the second a fortnight later, the third in the last week in July. A sulphate of copper and lime remedy for the blight is also prepared in powder form and dusted on the plants with bellows. London agents, Messrs. Barr & Son, King Street, Covent Garden. It is inexpensive and has been found very beneficial. If mildew or the potato fungus become firmly established in plants they are beyond cure ; the measures recommended are preventive rather than curative, and are only effective when resorted to on the first faint symptoms of fungoid attacks.

14. Timely Action.—In combating insects and enemies of all kinds, act promptly. When few, they are weak and easily subdued before they do harm ; when numerous they are difficult to destroy, and cannot be eradicated without trees or plants sustaining serious injury.

15. Caution.—All preparations containing petroleum should be applied in the evening ; if used in the morning, and bright sun follows, the leaves of plants and trees may be seriously injured by scorching.

LECTURE VI

PLANTING VEGETABLES AND FRUITS

High culture, soil formation and tillage, seed germination, plant food, and crop enemies, have each in turn been expounded, because they combine to form a safe foundation whereon to build successfully.

Turning now to our special subject, the planting of vegetables resolves itself into two sections, the first including those of a permanent character, such as Asparagus, Seakale, and Rhubarb, the other those of brief duration, which are raised and brought to perfection in a few weeks or months. For all alike, deep, rich, well-drained soil is indispensable if we would have produce of the highest quality, and we should rest satisfied with nothing short of that. At present we will refer to the permanent crops.

Asparagus.—This has no rival amongst vegetables in its season, yet it is seldom grown in small gardens or plots. This is probably owing to the fact of a specially prepared bed being once thought necessary for its culture, and also because it does not come into use the first season. Yet special beds are seldom required. We have only to plant one or two year old crowns, a foot apart in rows two feet asunder, carefully spreading out the roots, and covering with four inches of fine porous soil, to have a supply

of excellent asparagus in the course of a season or two after planting. To insure this the soil must be rich and deep; a top dressing of nitrate of soda in showery weather in summer will promote such free growth as will soon render the plants strong enough to come into use. When they are well established and growing freely, sewage may be used copiously. This is an especially valuable aid to asparagus culture on light or sandy soils.

It may be added that asparagus plants are as easily raised from seed as onions are, and in the same way.

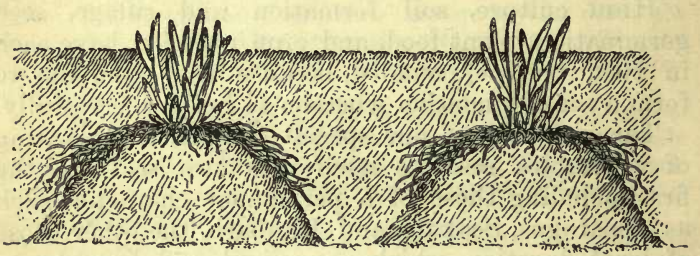

FIG. 20.—PLANTING ASPARAGUS.

Sections of ridges formed within the ground. These are made by stretching a line where the rows are to be, chopping the soil away on each side with a slanted spade, then rounding the top for the reception of the crowns and roots.

The seed may be sown thinly in drills, a foot apart, and one-and-a-half inch deep, early in April. If the plants come up an inch asunder they will be much better than if there are three or four in that space. In one or at the most two years they will be ready for transplanting, and if desired every alternate row may be left, to produce the much esteemed, succulent, and delicious heads; but in that case, a number of plants must be taken out of the rows that are to remain, leaving small clumps, eighteen inches from each

other. The plants so thinned out, with those in the rows entirely removed, may be successfully transplanted in April, or later, when fresh growths are springing from the crowns, taking care the roots are kept damp when out of the ground.

With the soil in a friable condition, not too wet, and a watering given to settle it round the roots, all the plants will grow, but if the planting is done in winter, or if the roots become much dried by exposure to the air in spring, most of them will die.

In some French gardens half-a-dozen good seeds are sown two inches apart, in clumps, here and there, in vacant spaces in borders or between fruit bushes, and one or two of the plants allowed to grow into bearing. Thousands of pounds are spent in this country every year on French asparagus, yet the plant is a native of our own country. In Cambridgeshire and Essex large breadths are profitably grown by farmers and allotment holders.

A gardener who grows produce for sale has found asparagus one of his most profitable crops. The heads washed, and tied twenty-five to thirty in a bunch, sold readily to greengrocers at 4*s.* per dozen bunches. At this moderate price they realized at the rate of £50 an acre ; and he observes that a man or woman can easily carry one pound's worth to market, while a horse and cart would be needed for an equal value of potatoes, cabbage, and many other vegetables. The beds are dressed in the autumn, after the stems are cut down, with ashes resulting from the burning of sticks, weeds, and other refuse. Manure, unless much decayed and well pulverized, is apt to make many shoots crooked and useless for selling.

Asparagus will not thrive in poor, dry, sandy land, nor in strong, wet, clayey, or cold adhesive soils. In

low wet localities raised beds are essential—two rows of plants in three feet beds, or three rows in beds five feet in width.

Seakale.—This is another much neglected spring vegetable, only found in market gardens, and large private gardens. It is probably because it is used only when blanched that its culture is thought to be difficult. On the contrary it is most simple, and strong plants of it are easily raised in a single season. Like asparagus it requires rich, well-drained, free soil, for though indigenous to the seaside, it is impatient of stagnant water.

Preparing and storing the sets, or root cuttings, is the first process, and an important one. These should be taken in autumn when roots are being lifted for forcing in frames, pots, mushroom houses, or even in boxes in a cellar. Clean straight cuttings, or as they are termed, "whips," should be selected from the trimmings of the large roots. They may be nearly as thick as the little finger, and about five inches in length, cut flat at the top, and slanting at the base, the better to distinguish the top of the set. These are usually tied up in bundles of fifty, and buried in sand or ashes, keeping the crown ends uppermost, and having these just exposed to air and light. They may be stored in cold frames, and even in sheltered positions outdoors, protected with leaves or litter in severe weather.

Before planting, which should be done about the middle of April, the ground must be deeply dug, and well enriched with manure. Also if the soil is of a light character it should be trodden or rolled evenly and regularly immediately it is dug, before commencing to plant.

The ground being thus prepared the sets should be taken out of their resting-place and planted

in rows from twenty to twenty-two inches apart, allowing fifteen inches apart in the rows. Young sprouts will have commenced pushing from the crowns before planting, and two or three of the best should be left upon each, until the plants are fully established, when all but one, the strongest, on each plant should be removed. Care must be

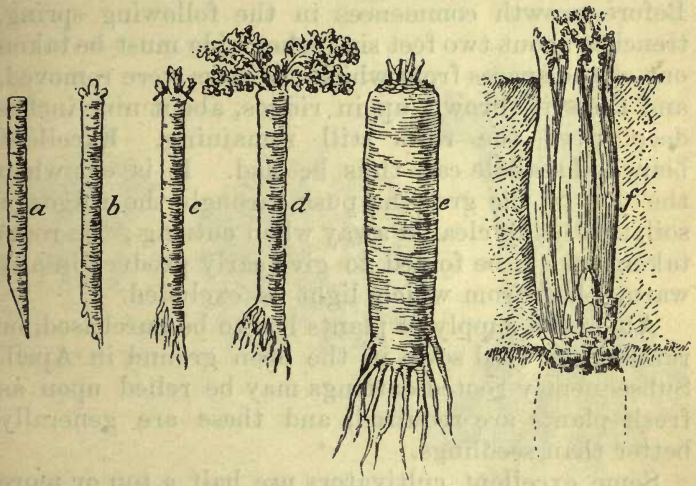

FIG. 21.—RAISING AND BLANCHING SEAKALE.

a, Root cutting made in the autumn; *b*, showing buds in the spring; *c*, rooted and growing, side buds marked for removal; *d*, rooting and producing leaves; *e*, root and crown with leaves removed in the autumn ready for forcing or covering with soil; *f*, growth from the crown ready for cutting and use.

taken in planting that the soil is made quite firm around each root, and if the weather sets in dry immediately afterwards they will require a thorough watering once a week until they commence growing freely.

The hoe must be frequently used amongst them in the early period of their growth, and until

their foliage has nearly met and covered the ground, not alone to keep down weeds, but also to induce rapid growth by admitting air and warmth to the roots from above, and preventing undue evaporation of moisture from below.

About the middle or end of October the first row may be taken up, leaving the next two rows, then taking up two others, leaving two more, and so on. Before growth commences in the following spring, trenches about two feet six inches wide must be taken out of the spaces from which the rows were removed, and the soil thrown up in ridges, about nine inches deep, over the rows still remaining. Excellent blanched seakale can thus be had. It is cut when the tips of the growths push through the ridges of soil, this being cleared away when cutting; the roots taken up can be forced to give early produce in any warm place from which light is excluded.

At first a supply of plants has to be purchased, or raised from seed sown in the open ground in April. Subsequently rooted cuttings may be relied upon as fresh plants are required, and these are generally better than seedlings.

Some excellent cultivators use half a ton or more of salt per acre, as a spring dressing for land in which seakale is to be planted. This salt dressing is equal to a quarter of a pound to each square yard, and it is also good for asparagus, in light soils especially.

Rhubarb.—This is one of the most useful of crops for home consumption, and one of the most profitable when grown for market. In a series of experiments with all kinds of garden crops in the North of England some years ago, account being taken of every penny expended in cultivation and received for the produce, strawberries paid the best over a period of eight years, but rhubarb closely followed; a rood of

it sold for £7 the second year after planting, and in five years the sum obtained was £90, or an average of £18—equal to £72 per acre.

As a market crop rhubarb is the most profitable when lifted and forced, so as to be ready for marketing from early in January to the end of March, during which period it finds a ready sale at remunerative prices. In the neighbourhood of Leeds the

FIG. 22.—RHUBARB.

The figure on the left represents a division with crowns for planting, the next a mature stool and crowns for forcing or yielding stalks naturally, the third forced produce.

cultivation of rhubarb for lifting and forcing is a great industry, hundreds of acres of land being so occupied.

The system of culture adopted is most simple but effectual. The roots are lifted for forcing at the end of the second or third year from planting; a sufficient number of roots is lifted each season, not only to furnish the quantity required for forcing, but also to

leave sufficient for planting the same, or a similar piece of ground again. For replanting, the roots are divided by the spade, taking care that each portion has a strong crown attached, and that the roots are damaged as little as possible, each root lifted usually furnishing four or more crowns for replanting; before this is done the land is deeply dug or ploughed and is heavily manured. The roots are then planted a yard apart in rows the same distance asunder. During the early part of the first season the hoe is frequently required amongst the young plants, to promote rapid growth, and to keep down weeds. Later on when the foliage of the rhubarb meets, and so covers the ground, weeds cannot flourish.

For forcing, the roots are simply packed closely together upon the ground floor of the sheds, leaving a pathway about three feet in width down the centre of each; some rich soil is worked in amongst and over the roots, and they are kept moist by watering, a temperature of 50° to 60° being maintained by the flues and very little light admitted. In this way are produced the immense quantities of rhubarb sold in the markets and shops.

A cottager who has only room for a few roots may readily force one or more of them without lifting, by covering them with old casks, which should be painted black or tarred outside (not inside), and covering these in turn with leaves, long strawy manure, or litter of any kind, if such be available. It should here be stated that roots lifted and forced, as described, are of no further use afterwards, except to be rotted down as manure, and it would be a mistake to replant them again.

Fruit Planting.—Formerly regarded as an article of luxury, fruit now takes rank as a desirable compound of the dietary of healthy persons, and,

under medical advice, as an important addition to that of invalids; it is justly regarded as wholesome and economical. The general demand for it is steadily increasing, and every cultural point becomes proportionately important.

The basis of successful planting is the preparation of the soil. Constantly are we asked by beginners as to the suitability of soil for fruit culture, and our answer to all is, that soil which will yield first-class vegetables answers equally well for fruit. This is seen in the best market-gardens, in which both are grown together, and grown so well too as to enable the cultivators to pay rents of from 5*l.* to 10*l.* per acre.

This may perhaps cause some to imagine there is little left for the tenants and workers; but the fact is the splendid culture adopted enables the grower to derive far better profits than are obtainable from low-rented, ill-managed land, and pay a far greater number of men higher wages into the bargain. It is sound, thoughtful, thorough work that tells, and no work should be more thoughtfully and thoroughly done than preparing land for planting fruit-trees.

In fruit culture extremes must be guarded against. The fault of the past has been the indiscriminate planting of worthless sorts of fruit by farmers, and of collections by gardeners. Selections of sorts will be given in another lecture; meanwhile let us endeavour thoroughly to acquire every detail of planting and cultivation in the early stages of growth.

We may assume that the plantation soil answers fully to our conceptions of rich, porous, well-drained land; that it has been well broken up by spade work or other means, and is ready for the planting.

Plant when the leaves fall, and as soon as trees can be obtained from the nursery. If the roots are at

all dry on arrival, as is frequently the case, they should be moistened by any available means. If very dry, plunge them in water when convenient, and let them remain there for some hours; then well cover them with fine soil. Let this be clearly understood, that if the roots are much exposed to dry air

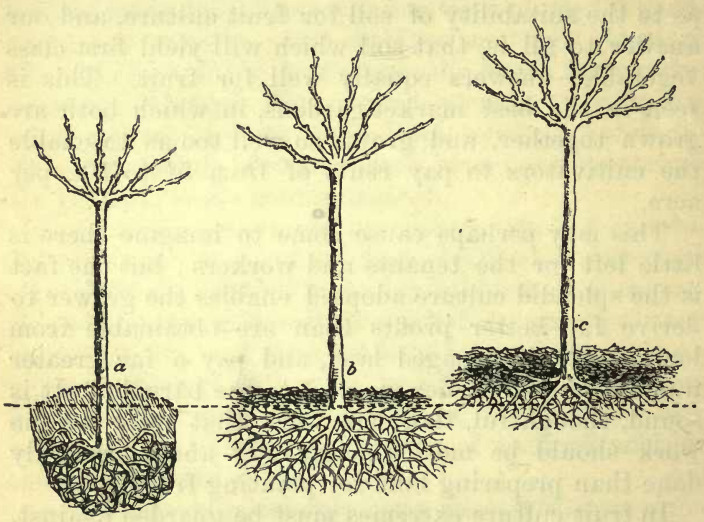

FIG. 23.—PLANTING TREES.

a, Bad planting, the roots twisted and sunk much too deep and the soil piled up the stem like a cone; *b*, good planting in drained land, the roots spread out evenly just within the ground, and the surface covered with littery manure; *c*, planting almost on the surface in wet or low-lying ground, the soil for covering the roots being taken from between the trees, and mulched with manure.

and frost in transplantation, the trees will not grow freely, and some may die.

Plant at the same depth the nurseryman did, not deeper. The earth mark on the stems is clearly visible for guidance. Shorten long roots and cut off broken ends smoothly; spread out and pack every

root carefully in fine soil, which press firmly about them by carefully treading, not ramming the soil hard as is sometimes advised. Secure the trees firmly to a suitable support, providing a soft pad to prevent abrasion of the bark. If a surface dressing of some such manure as peat moss litter, out of a stable, or short farmyard manure, can be given at once, it will do much good. Spread it on two or three inches thick, a foot farther than the roots extend.

Thin out small and crowded growths at the time of planting, and half shorten the long young main branches; then in spring, when the buds swell, cut each shoot still lower, pruning to the bud from which new growth is required. Prune with a clean short slope, just above the bud, so as to leave plenty of stored sap to sustain the embryo shoot when growth begins, and let the end buds point outwards, as the growths will take the same direction and make an open tree.

Watering, both of fruit and vegetables, must be thorough when it is done. A mere wetting is useless, and to retain moisture in the soil, apply the surface dressings, termed mulching. It has been stated before, and we desire to enforce the truth by repetition, that in hot weather it is always best to water either in the evening or as late as possible in the afternoon, to avoid the rapid evaporation which occurs when water is applied in the full glare of a hot summer's day.

QUESTIONS AND ANSWERS.

Q. If it is not necessary to form raised beds for asparagus, why are such beds always provided for growing this vegetable?

A. They are by no means always provided, large quantities of the finest produce being afforded by plants in level ground. Where this is deep, rich, friable, and either naturally or artificially drained, so that the water passes freely through it into the subsoil, raised beds are not required by the plants, though their owners may, perhaps, like to see them; in low-lying positions, with water standing within two feet of the surface, raised beds are advantageous.

Q. Salt is said to be good for asparagus: is it best given in the winter or summer?

A. It is best applied in the spring when the weeds are first showing a tinge of green, giving sufficient to destroy them—about a quarter of a pound to the square yard. This is beneficial, especially on land of a light, dry nature. Salting in the autumn or winter makes the ground too wet.

Q. Then it would not be good to give liquid manure in the winter, would it?

A. It may be used with far greater effect in summer to encourage strong growth, and the stronger the stems are, if not broken by the wind, the finer the crowns will be, also the heads which they produce for cutting.

Q. What is the reason the French asparagus is so large and white while the English is much smaller and green? Are the varieties different?

A. No, it is not a question of variety but management. The French draw ridges of earth over the crowns, and the stems thicken in it; as soon as they extend above ground they naturally taper, becoming thinner the taller they grow, and green by exposure to the air; but only a small portion of the blanched heads are eatable, and "fat" green stems are preferred by many, if not most, persons in this country. The chief point to aim at is strong summer growth, not cutting much after the middle of June, then fine heads either white or green may be had from the same row or bed according to the desire of the owner or cultivator. The largest heads are cut in spring from plants which make very strong summer growth in rows four feet asunder.

Q. How soon is asparagus ready for cutting after sowing the seed, and how long do the plants remain productive?

A. Three or four seasons' growth are requisite, according to the nature of the soil, before heads are large enough for cutting. In favourable soil, and with good management, asparagus is productive for a generation. We know an excellent bed more than fifty years old.

Q. If you were going to raise asparagus from seed, what variety would you sow?

A. The Early Argenteuil, or, failing to obtain seed of this, Connover's Colossal.

Q. Seakale, we understand, can be raised from seed, or by root cuttings, in the spring, and the plants will be ready for giving produce the following year. Is that a correct impression?

A. It is very nearly, but needs a little correction. The root cuttings must be made in the autumn, and they will form growing buds by the spring. This is a distinct gain, and large crowns form in good soil the same season, many of which afford produce (forced) by Christmas, still finer after the turn of the year, and very large heads if left to grow naturally through mounds of soil piled over the crowns. Seed is sown in spring, and several of the plants so raised develop good crowns by the autumn.

Q. You say seakale may be produced from the crowns in any dark place. How is it managed?

A. The strong roots, each with a crown at the summit, are planted their full depth close together, in beds, boxes, or large pots of soil which is kept moist. If they are not in a totally dark place they must be covered to exclude every ray of light, and the "kale" will be white and tender. Any person may have it in winter, with a little care and thoughtful attention, who has good crowns at command.

Q. What is the summer treatment of plants established in the ground?

A. After the produce is cut a number of growths push from the tops of the roots; these must be thinned when about two inches long, leaving one, two, or three, as there may be room for the leaves to expand, then good crowns will follow. If flower heads appear, they must be cut off before the flowers open. These heads of tender buds are delicious when cooked in a green state. Flowering, or rather seed ripening, weakens the plants considerably.

Q. Will you please name the best sorts of rhubarb?

A. Hawke's Champagne or Linnæus for early use, Victoria for producing a later supply of larger stalks.

LECTURE VII

PROFITABLE CULTURE

Green Crops and Small Fruit

IMPORTANT as large fruits, especially apples, undoubtedly are, and valuable as are root crops, as will be shown, there are various green crops of very great service, also soft or bush fruits that are easy to grow, and which bear good yields sooner than do the larger kinds. Success in their production depends on correct methods of cultivation.

Procedure.—The line of cropping to adopt so that the most satisfactory results may be obtained, can only be determined by a consideration of local circumstances, such as the nature of the soil and the facilities for disposing of the produce.

In respect to soil. Suppose a man had one portion of his land heavy and wet and desired to grow, say, potatoes of the best quality, and a heavy crop of broad beans, he would not, if he were wise, plant the strong land with potatoes, and lighter and drier with beans, but the reverse, because only in that way could he do the best in his power for both crops. Or if he wished to grow small fruits, he would not plant, say, black currants and raspberries in the driest parts, and red currants and gooseberries in the

heavier and wetter, as if this were done the best would not be made of the position.

Object.—Then the main object for which the crops are grown must be considered, whether for home use mainly, or for sale chiefly; if for home use those which are known to be the most serviceable at home must be grown in the greatest quantity; if for sale the facilities for marketing must have consideration, for no matter how good any kind of produce may be, if it cannot be sold or used it is obviously grown at a loss.

Green Crops.—It is well known that some of the chief green crops of the garden, grown for sale, give a good return to the cultivator, but only when they are of the first quality and placed in the market early; if only moderate to inferior, also late in the market, they will yield small or, it may be, no profit to the grower.

Take for instance cabbages: sow early hearting sorts in July, grow them stiff and sturdy from the first, plant them in rich soil, keep this stirred in the spring, dress with nitrate of soda, thus pushing on growth, so as to be first in the market with the crop, and it will sell for at the least £50 an acre; but be a fortnight behind, when the market is glutted, and there may be a difficulty in selling at £20, and leaving no profit on the culture.

The first sum, and much more, is realized by the first sales of lettuces in the market. Hundreds of thousands are raised by sowing very thinly, under glazed sashes, in October, transplanting an inch or two apart after the turn of the year, sheltering with glass, mats, or straw screens, then finally putting out, a foot asunder, as soon as the weather is mild enough for growth in the open. That is the way the most profitable of the tall White Cos lettuces are grown,

and the care taken in having them ready early doubles the value of the crops.

The Brown Cos variety, sown in the autumn and grown thinly, so that the air plays round every plant and makes it hardy, often stands the winter without protection, and the lettuces that follow may pay the grower well. If tied up when dry, in April, May, and June, they sell readily at 8*d.* and 10*d.* a dozen,

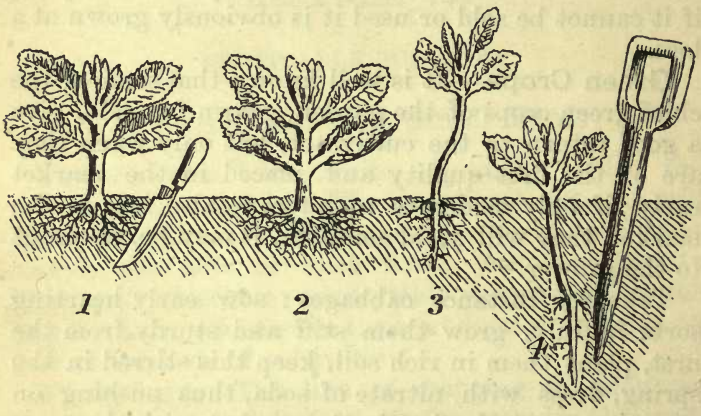

FIG. 24.—RAISING AND PLANTING GREEN CROPS.

1. Thinly-grown sturdy plant properly taken up, and planted, (2) in the best soil. 3. A spindling, through overcrowding, dragged up and then thrust down with its few roots into the subsoil.

according to earliness and quality ; and grown a foot apart, crops have realized £70 an acre.

Last year a hard-working gardener sowed seed of Lee's Hardy Hammersmith Cabbage Lettuce, very thinly, in drills a foot apart, towards the end of August, and as soon as the plants appeared thinned them to three inches asunder at first, and afterwards drew a few more out, leaving them from six to eight inches apart. Nearly all passed through a very long

and severe winter, snow protecting them, hearted quickly in the spring, and some were sold for 1*s.* per dozen, the later at 6*d.* per dozen. He had about two rods of them quite in the open, and sold the crop for £2, or at the rate of £160 per acre; but that was because no others could be had in the district.

FIG. 25.—RESULTS OF GOOD AND BAD MANAGEMENT.

1. The results of 1 and 2 in the preceding figure. 2. The result of 3 and 4 same figure. 3. Lettuce developed in ample space—plants a foot asunder—crop valuable. 4. Three plants in the same space—crop profitless.

Brussels sprouts, when very fine, sell for a penny a stalk sixteen to eighteen inches long covered with knobs, and that is at the rate of £30 per acre, after allowing a margin of 25 per cent. for failures, or second or third rate plants.

Savoys often realise equal amounts. Autumn giant cauliflowers still more in rich soil, and allowing even half for expenses in culture, there remains a fair profit behind. Even coleworts or bunch greens —a kind of young cabbage, sown in May, and the plants dibbed in a foot apart, on land that becomes vacant by the removal of early crops—commonly realize £15 to £20 an acre. The land is not dug but hoed, therefore the cost of culture is trifling. Cot-

tager's and curled kales are serviceable winter greens for home use; and close cauliflower-like heads of broccoli are always acceptable in spring, but the plants are sometimes killed in the winter.

Radishes raised early in rich ground are very profitable. The seed is sown thinly in February, or as soon as the ground is in a suitable condition, and the beds littered with short straw. When the plants appear this is quickly drawn off with wooden rakes into ridges on the windward side, and lightly cast over again at night. An acre gives 1,400 or 1,500 dozen bunches, and at sixpence a dozen brings £30, the land being then at liberty for celery or other crops. Sowing radish seed too thickly is not only wasteful at the outset, but crowded plants cannot produce the crisp, tender, coveted roots. See page 109.

One excellent cultivator follows his radish crops with celery, which gives him a profit of £30 an acre. The plants are raised in beds of fermenting manure covered with soil, in March, and protected with sashes. They are subsequently pricked out two or three inches apart, in an inch or two of soil spread on three inches of decayed manure, watered and sheltered. In that way they take up with bushy roots and are trimmed for planting in well enriched ground in shallow (not deep) trenches early in June. Celery requires much water. Three earthings suffice; the first when the plants are fifteen inches high, flooding the trenches previously; the next about three weeks after; and the last on the approach of frost. The stems must be dry when the earth is placed against them.

Good rows of the best sorts of peas are welcome in every garden, and any surplus can generally be sold to advantage. Scarlet runner beans are similarly useful, and easily grown with or without sticks. In some

districts it is the custom to plant early potatoes in rows forty-two inches apart in March; plant beans between the rows in May, chop off the twiners as they appear with sharp hooks or knives, and so make the plants dwarf. In that way they bear early and heavily, the crops usually selling for £20 an acre, and the early new potatoes at a penny a pound easily realize £25, heavy yields decidedly more.

The fact is all kinds of green crops, even vegetable marrows, are profitable, when the best varieties are well grown and placed in the market at the time they are wanted; but by no means are all persons in a position to sell them to advantage, and judgment is needed in this matter.

Small Fruits.—These are particularly appropriate to small gardens, and soon produce crops that are of great service in families. The fruits to be referred to are strawberries, raspberries, currants, and gooseberries, and some of most, if not all, of them should be found in every garden that is attached to a home.

No kind of fruit comes into bearing so quickly as the strawberry does. Strong plants put out in July bear a very profitable crop the next year, and smaller ones planted in September give a full yield the second season. This amounts to about 4,000 lbs. per acre, and at 4*d.* a pound the crop is worth nearly £50, but the expenses of management, picking, and marketing are considerable—altogether about £17, as founded on experience in Hampshire, where 1,500 acres are grown in one district, in various sized allotments ranging from a quarter of an acre to 10 acres in extent. In some parts of Kent strawberry culture has supplanted wheat culture to an extraordinary extent, and much land has increased in value in consequence. See page 149.

Raspberries are always in demand, and any cottager can grow them in good soil in his garden. They grow well in moist and rather shaded positions, and are extensively planted between fruit trees, though if the land is rich and deep, the best crops are obtained in the open. The canes may be tied to stakes or wires, or grown, as hundreds of acres are, without anything to support them. Small canes with bushy roots should be planted in the autumn and cut down 9 inches from the ground, then strong growths will push up for bearing. Fair crops are obtained the second year, good crops the third. Raspberries are often as profitable as strawberries, and good fruit is always in demand.

An allotment holder in Sussex has a row of raspberries which forms a hedge along one side and across the end of his plot. It is 160 yards long, and gives him between £3 and £4 worth of fruit a year, sometimes more, but the ground is rich and deep, the growth strong, and the management good.

On some field allotments in Kent, on which potatoes had been grown for years, the land became known as potato sick, a labourer named Collins planted his half acre with raspberries and strawberries, a quarter of an acre of each. Three years afterwards he sold his strawberries for £40 and his raspberries for £35. The raspberries would go on bearing for several years, but strawberries are generally at their best in three years. Assuming he got nothing the first, and half a crop the second year, then allow £25 for planting and all expenses, he then had an average profit of £30 a year. This is a splendid result from half an acre of land, and the man ought to have had a medal. He used 16 tons of manure, and thus made his soil productive. The variety he grows is Carter's Prolific. Superlative

and Rivers' Hornet are stronger growers and free bearers.

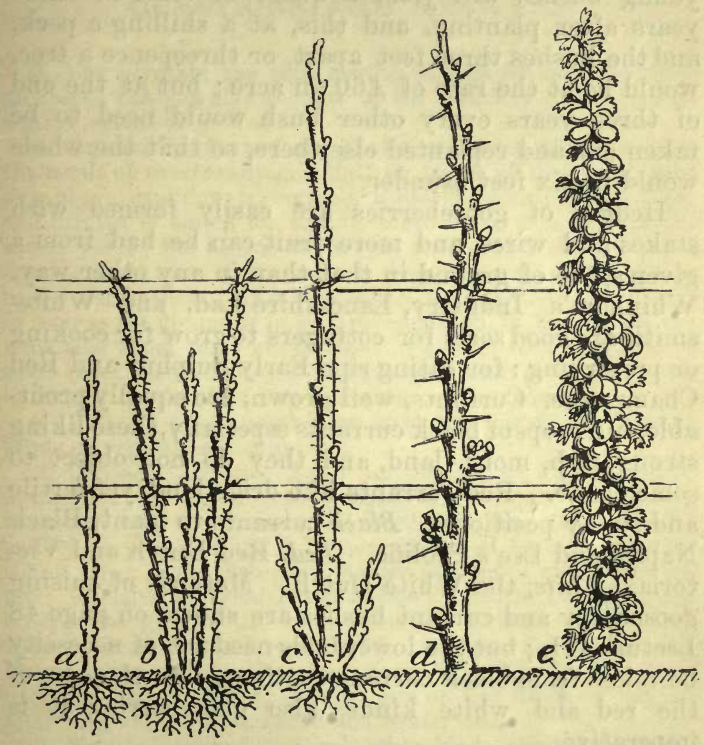

FIG. 26.—RASPBERRIES AND CORDON (OR HEDGE) GOOSEBERRIES.

a, Small but *well-rooted* Raspberry Cane, *good;* cut back, when planted, to the crossbar in *b*, and two strong resulting growths for bearing. *c*. Strong cane (not cut back) with *few* roots, *worthless*,—no good basal growths for bearing. *d*. Winter pruned single-stemmed Gooseberry. *e*. The tree in bearing: plant 9 inches asunder and pinch side growth in summer (see page 110). Raspberries for hedges, plant a foot apart. Cut out the old canes after bearing, and train young ones about 6 inches apart for the next crop, and so on from year to year.

Gooseberries, in good soil and properly pruned, are very productive, and the crops seldom fail, also, as

most of them are gathered green, birds and boys do not take much of the fruit. Good well-managed young bushes will yield a quart of fruit in three years after planting, and this, at a shilling a peck, and the bushes three feet apart, or threepence a tree, would be at the rate of £60 an acre; but at the end of three years every other bush would need to be taken out and replanted elsewhere, so that the whole would be six feet asunder.

Hedges of gooseberries are easily formed with stakes and wires, and more fruit can be had from a given space of ground in that than in any other way. Whinham's Industry, Lancashire Lad, and Whitesmith are good sorts for cottagers to grow for cooking or preserving; for eating ripe Early Sulphur and Red Champagne. Currants, well grown, are equally profitable, full crops of black currants especially, these liking strong, rich, moist land, and they do not object to some shade. Red currants like drier land, yet fertile and sunny positions. *Black* currants to plant, Black Naples and Lee's Prolific. *Red*, Red Dutch and Victoria. *White*, the White Dutch. Methods of raising gooseberry and currant bushes are shown on page 48 Lecture III.; but the lower buds need not of necessity be taken from black currant cuttings. In the case of the red and white kinds, also gooseberries, it is imperative.

By comprehending the chief points in the cultivation of the important crops alluded to, as briefly set forth, and carrying out the instructions thoughtfully and well, there cannot be a doubt that a much higher standard of productiveness would be established in gardens and allotments than now generally prevails, and they would give to the tillers a good return for their diligence and skill.

QUESTIONS AND ANSWERS

Q. You advocate the thin sowing of seed for raising almost all crops; can you give an idea of the quantity of seed to sow a given extent of ground?

A. One sturdy plant of any kind is worth ten tall weaklings, the result of overcrowding. Half an ounce of such small seed as cabbage, cauliflowers, broccoli, Brussels sprouts, kale, savoys, and turnips is ample for sowing broadcast over a bed of five square yards; but no one can err by sowing in drills six inches apart and not more than an inch deep, the seeds not touching each other in them. It is prudent to sow a portion of the seed, as soon as the ground is in suitable condition, in March, and the remainder about three weeks later. Cabbage seed must also be sown about the middle of July and again during the first week in August for the chief crops in spring and early summer.

Q. Will you please name a few good varieties of the different kinds of vegetables mentioned?

A. Cabbage: Ellam's Early for sowing in July; Enfield Market for sowing in August; Early York is good for sowing in spring, and the Rosette Colewort from the middle to the end of May. Cauliflower: Snowball, small, early; Autumn Giant, large, late. Broccoli: Winter Mammoth and Leamington; for later use Model and Sutton's Late Queen, but these occupy the ground till May. Brussels sprouts: Exhibition. Kale: Cottager's and Dwarf Curled. Savoys: Early Ulm and Dwarf Green curled. Turnips: Early Milan for the first sowing, Snowball to follow, Orange Jelly or Red Globe for sowing after midsummer for autumn and winter use.

Q. Similar information about other kinds alluded to in the lecture would be useful, such as peas and beans, what sorts to get, when to sow, and how much seed to place in a certain length of row.

A. A pint of small early peas will sow a row sixty feet long, the larger and later sorts a length of eighty feet. Chelsea Gem is a good early dwarf for growing, with or without sticks, in rows eighteen inches apart. William I., early, three feet high; Sharpe's Queen and Stratagem, later but better, about the same height. Duke of Albany, four or five feet, fine. Ne Plus Ultra, five to six feet, superior quality. Sow the early sorts on the first fine day in February, following with any others as

soon as the preceding appear above ground till the end of May, but the crops are not usually very full after the April sowings. The choice of varieties depends on the supply of sticks, or wires, for their support. Let the space between the rows exceed the height of the plants. Beans (broad)—a quart of seed will sow a row of eighty feet. Bunyard's Exhibition and Seville Long-pod are fine varieties; sow as early as possible in the year and successively till May. Dwarf Kidney—half-a-pint will suffice for a row of eighty feet, Ne Plus Ultra and Canadian Wonder being good varieties; sow at the end of April and in May. Runners—a pint will sow a line of eighty feet; time, May. Varieties: Ne Plus Ultra, scarlet flowers; Giant White, white flowers.

Q. Celery has had attention, also radishes and lettuce, with an allusion to vegetable marrows, please name good varieties of these and state times for sowing?

A. Celery, as was stated, is usually raised in frames in March, sowing thinly in boxes or seed pans, but plants may be had by sowing in light rich soil on a bed of manure covered with a handlight or old sash in a warm position in the garden, early in April. Varieties: White Gem, Sulham Pink, Major Clarke's Red. Boxes about six inches deep, three parts filled with soil and covered with squares of glass made secure, are useful for raising celery and other plants that are required as early as possible. If the seedlings come up a quarter of an inch asunder they will be much better than if closer, and half an ounce of celery seed will give many hundreds of plants. Lettuce is obtained by sowing the varieties mentioned in the Lecture in the autumn, also the sort named All the Year Round. The tall Paris white cos (also any of the varieties named) is sown as soon as possible in spring and at fortnightly intervals, a pinch at a time, through the summer, half an ounce of seed affording thousands of plants. Endive, useful for late and winter salads, is sown twice or thrice in July; the round-leaved Batavian is the most serviceable. It must be blanched by covering, when large enough, to exclude the light, or tying up all the leaves when they are perfectly dry into a bundle. The old Long White is still the most useful vegetable marrow. Plants are raised in frames in April, and grown sturdily in pots for planting early in June on stations containing half a bushel of partially decayed fermenting manure covered with rich soil. They are protected from cold winds with handlights or baskets to facilitate their growth. Ridge cucumbers are treated much in the same way, but are more tender and should be assisted with warm water when moisture is needed.

Q. Have you not forgotten radishes? If they can sell for £30 or £40 an acre we should like to know a little more about them and the varieties.

A. The prices named are not in the least uncommon in very rich, deep, dark soil. Crops are frequently sold for £50 and upwards in the Vale of Evesham, and an acre has realized £100, but that is exceptional, though worthy of record. Too thick sowing ruins the crops. The seed leaves (page 46) must have space to develop for the quick production of roots, and the plants must be sheltered, as stated in the Lecture. The work takes time, but it pays when properly done. An ounce of seed is

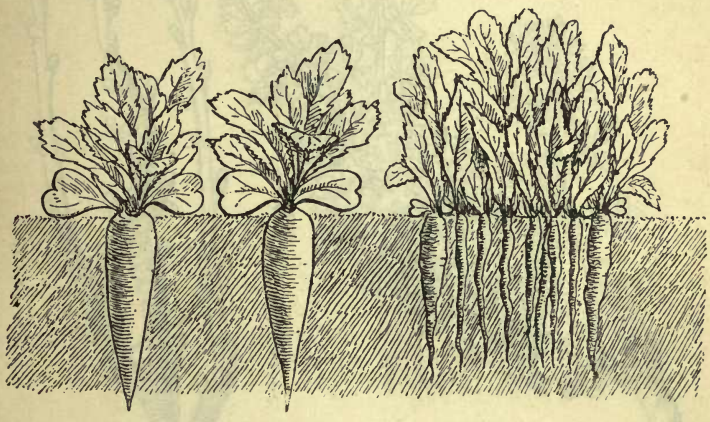

FIG. 27.—RADISHES—PROFIT AND LOSS.

Thin sowing and fine roots; thick sowing and useless roots—a waste of seed and soil fertility.

ample for five square yards. The varieties grown are the long red, red and white turnip rooted, chiefly the red, and the oval shaped French Breakfast varieties. It may be added that if radish and other seeds are made damp with petroleum, such as is burned in lamps, and dusted with red lead they are rendered distasteful to birds and mice and not injured by the dressing.

Q. Just one question about pruning fruit bushes. Is summer pruning really better than winter pruning, and when should it be done?

A. If the main branches of gooseberry and currant bushes are too close together, producing a thicket of growths, and the

canes of raspberries crush against each other in the summer, no one has a right to expect good crops of fruit. The evil of overcrowding must be prevented by taking the ends off the side

FIG. 28.—PRUNING GOOSEBERRIES AND BLACK CURRANTS.

Summer shoots x x, pinched about midsummer, to prevent crowding; these to be cut back in winter to within an inch of the base (see upright cordon *d*, p. 105). Extension growths allowed if more than six inches apart as shown. Black Currant (on the right). Old branch marked for cutting out to give more space to the young shoots for bearing and those not shortened.

shoots before midsummer down to five or six pairs of leaves from the base, so that the sun and air can act on these leaves; also young suckers should be drawn from raspberries till those that

remain stand clear of each other, the leaves scarcely touching, and fruitfulness will be induced. Black currant growths, however, must not be cut back like those of red and white currants and gooseberries, but should be simply thinned like raspberries to let the sun shine amongst and between the growths retained. The side shoots shortened in summer are cut back in winter to about an inch of the base, and the main branches ought to be about nine inches apart. Bushes so treated become heavily laden with fruit, provided the soil is good, and the roots near the surface of the ground are not mutilated with the spade.

LECTURE VIII

PROFITABLE CULTURE

Root Crops, Tomatoes, Mushrooms, and Fruit Trees

HAVING referred to the smaller kinds of fruits, and to vegetables that are either grown for cooking in a green state, or using as salads, the larger growing fruits now demand attention, with the most useful of our root crops.

Potatoes.—Of root crops the potato is altogether the most important, not only because it is an indispensable article of food upon every dinner table, from the labourer's cottage to the palace of the Queen, but also because it is a profitable crop, when judgment and skill are exercised in its cultivation. Not difficult is it to understand this if we compare results. The cost of growing an acre of potatoes in this country may be quoted at £10. It is sometimes a little more, or less. If the crop is a fair one and is of late potatoes, it will realize from £20 to £30. In a large potato-growing district in Lincolnshire, hundreds of acres were sold before digging (in 1891), at from £23 to £30 an acre, for such varieties as Magnum Bonum and Sutton's Abundance ; but some acres of Reading Giant realized £40 an acre. This proved the best

yielder and disease resister, and though the tubers are large, they are of good quality.

Varieties.—For affording the first produce, the earliest varieties of the Ash-leaf type should be chosen, and the tubers carefully prepared for planting. Sutton's Ringleader is one of the quickest in ripening, and when the newer Early Laxton becomes plentiful it will be extensively grown. Sharpe's Victor, Veitch's and Myatt's Ash-leaf are popular varieties. It is well to try different sorts, and increase those which succeed the best in any particular soil, for potatoes, like their growers, have individual preferences and peculiarities.

Preparing the sets.—The preparation of the seed begins when the crop of the current year is lifted. Sound tubers, of medium size, are then taken and set on end—the eyes kept upward—either on portable frames, trays (Fig. 29, next page), or shelves in a frost-proof building, with such light as comes through an ordinary cottage window. Gradually, during the winter, a shoot as stout as one's little finger appears on the upper end of the tuber: by the end of February it is surmounted by a crown of leaflets, and rootlets protrude from its base. When required for planting the sets are carefully removed and placed in the ground without the shoots being injured. Growth follows with marvellous rapidity, none of the pristine vigour of the tuber having been wasted. A full crop of fine large tubers is a certainty, other conditions being equal. This is very different to the old method of placing the potatoes in a heap covered with straw and soil; or piled up in a dark room, or cellar. Yet that was once the only way, the crowded tubers making long white weakly growths which were rubbed off, in some instances repeatedly, till planting came, to be followed by a weakly uneven growth of haulm

and an inferior crop of tubers, see the illustration below.

Distances for Planting.—When early potatoes are grown in rows two and a half feet apart, winter crops, such as Brussels sprouts and others mentioned in the last Lecture can be planted between them;

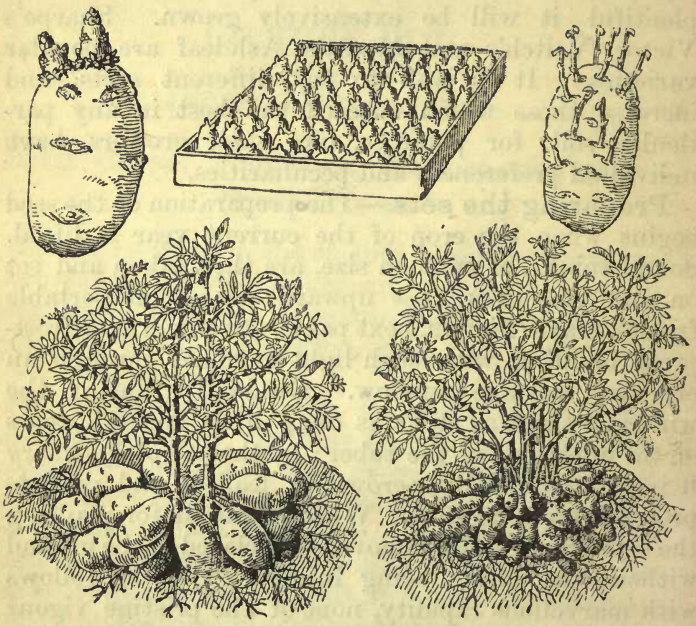

FIG. 29.—SEED POTATOES AND RESULTING CROPS (see page 113).

Prepared set (as in tray) and its crop on the left; weakened set and its crop on the right.

and when still wider apart dwarf kidney beans or the more profitable and useful runners, kept trimmed, can be inserted in May for occupying the ground after the potatoes are dug. (See page 103). Vegetable marrows have also been planted as a succeeding

crop, as also have strawberries. Early potatoes only occupy the land half the season, late sorts remain the whole season, but yield heavier crops.

Potatoes are commonly planted too closely. Without intercropping, the rows of the earliest sorts should be two feet apart, in rich soil; second early, medium-sized growers, such as Beauty of Hebron, Early Regent and Chancellor, two and a half feet; and the strong growing late sorts, such as those named on page 112, also The Bruce, Cheal's Prolific, and Imperator, indeed all of a robust character, ought to be allowed a space of three feet between the rows. The last-named is the best late potato for poor soil: in rich land the tubers grow too large and unshapely. Manures for potatoes have attention in Lecture IV. page 68, and methods of preventing the disease in Lecture V. page 84.

Onions.—These are next in importance to potatoes. They are used when young for salads, a brisk sale also being found for them in this state for consumption with the workman's bread and cheese. These "bunching" onions are sown towards the end of July, about fifty pounds of seed per acre being used broadcast or in drills. They are sent to market in May and June in fan-shaped bunches. This is a profitable crop, often yielding £50 per acre, and under brisk market-garden practice the land cleared so early in the season is soon under some other crop. Those young onions when transplanted in March produce fine bulbs in summer, usually free from the maggot. Small pickling onions, the result of sowing thickly in poor soil in May give a profitable return.

In 1890 Messrs. King, of Broome, in Bedfordshire, grew 130 acres of onions for bulbing. The crop averaged eleven tons per acre, which at £10 a ton brought the startling gross total of £14,300.

All varieties of onions succeed when sown in the autumn, but the White Lisbon and Golden Rocca are favourites. To sow in March, for autumn use, choose White Spanish or Bedfordshire Champion, Brown Globe for winter and spring use; Silver-skinned for pickling; Ailsa Craig for exhibiting. The cost of preparing land for onions is about equal to that of all ordinary crops. The soil must be deep, rich, and fertile, the usual dressing of manure being about sixty loads from the farmyard per acre, supplemented with top dressings of soot.

Carrots.—These afford a return of about £40 per acre in suitable soil. Early Horn and James's Intermediate are the favourite sorts. The market-garden process of culture is to plough in manure in the autumn, not in the spring, ten pounds of seed per acre being sown as soon as the ground is ready in spring, in drills a foot or a little more asunder. Thinning is done as soon as the plants can be handled, and the ground is kept free from weeds. Pulling commences when the roots are about half an inch in diameter, from twenty to forty being put in a bunch. From 300 to 400 bunches per acre is a fair crop. For maggot prevention, see page 81; for thinning, see page 145.

Parsnips.—Good crops of clean roots, which can only be produced in deeply-worked land, give a good return to the cultivator. The roots become forked and unshapely in hard soil and recently-manured land. In some districts parsnips are grown in every garden; in others they are scarcely seen. The roots are nutritious and have often been very useful when the disease has spoiled potatoes. Sow in March when the ground is friable, in rows fifteen inches asunder. An ounce of seed will sow a drill 200 feet long, and ten pounds suffice for an acre. The Student

is a good variety. Rich ground should have a dressing of lime for this serviceable crop.

Beet.—This is a profitable crop when there is a demand for the roots. They sell in London for a penny and three-halfpence each. If sold for sixpence a dozen a good crop will be worth £70 an acre. The end of April is soon enough for sowing—in drills the same distance apart as parsnips. An ounce of seed will suffice for a length of fifty feet. The turnip-rooted kind is good for early use, Dell's Crimson or Blood Red for general purposes. Root crops generally have an advantage over green crops in keeping till favourable opportunities occur for their disposal.

Tomatoes.—The question is often asked, "Is the tomato a fruit or a vegetable?" It is classed as a vegetable. Its fruits are eaten; but as vegetables, mostly cooked, and if not cooked, not sweetened. If prizes are offered for say six kinds of fruit at an exhibition any collections that contained a dish of tomatoes, unless specially provided for, would be disqualified.

An eminent physician, Dr. Bennett, says, "The tomato is one of the most powerful deobstruents of the *Materia Medica;* and in all affections of the liver it is probably the most effective and least harmful remedial agent known"; also, the doctor goes on to say, that "when used as an article of diet, it is almost a sovereign remedy for dyspepsia and indigestion."

What wonder, then, that the demand for tomatoes during the last ten years should have increased at least ten thousandfold! Under the popular name of Love-apple they used to be grown for ornament only, but now their production has become an industry, and certain it is that vast numbers of persons may, if they

like to try, grow tomatoes in their gardens. Plants must be raised under glass, and persons who have not the requisite convenience for the purpose should buy strong plants at the end of May. They are cheap, and good crops of tomatoes are very profitable.

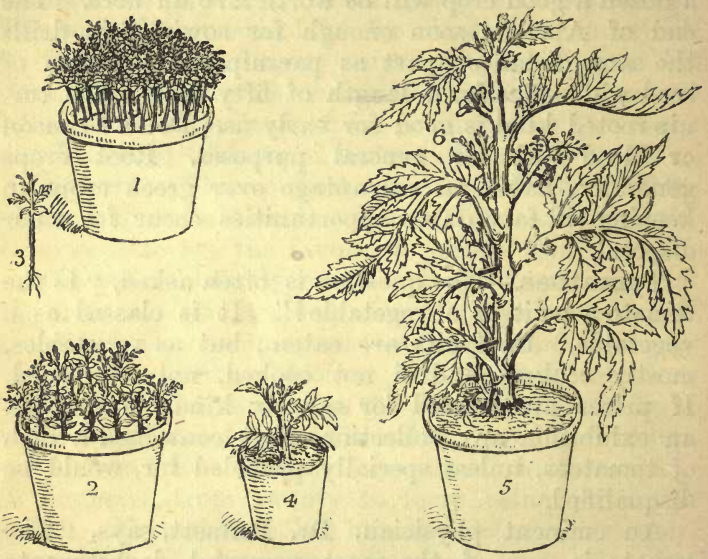

FIG. 30.—RAISING TOMATOES.

1. Too thick sowing and spoiled plants (3). 2. Thin sowing and sturdy plants, potted (4), shifted (5), and grown strong for planting, flower buds showing. All axillary or side growths (6) should be pinched off as indicated by the bars on the left side of the figure.

Mushrooms.—Attention must be directed to yet one other esculent, or important food crop—mushrooms. Though belonging to a low order of vegetation (fungi), mushrooms contain more nitrogenous matter, and in that respect more nearly approach animal food than does any other vegetable, while when fresh and properly cooked, they are considered by most persons to be very delicious. In Australia

mushrooms are called "native bread," and one kind (of fungus) is known as the "poor man's steak."

Mushroom-like fungi, with yellowish or shining caps, and pallid or black gills, are not safe. If, in case of doubt, a silver spoon or coin be placed in the cooking apparatus, and not discoloured, the preparation is said to be safe, if discoloured there is ground for suspicion. When mushrooms, however, are grown artificially, as they are in stables, beds and cellars, also on ridges in the open air, every doubt is removed because only the genuine kind is increased by spawn.

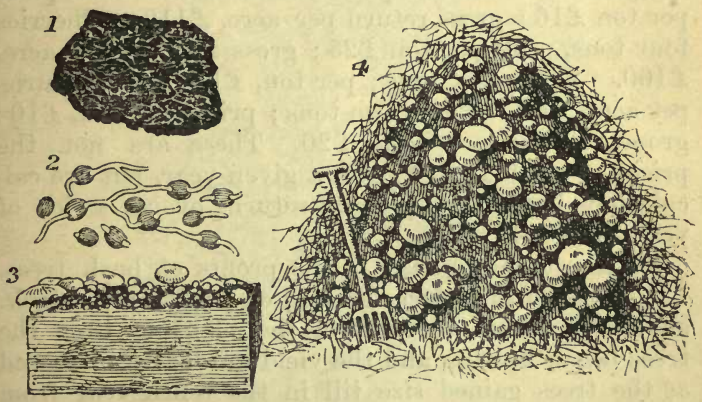

FIG. 31.—MUSHROOM CULTURE.

1. Spawn. 2. Spore germination. 3 Mushrooms in boxes. 4. Mushrooms in beds.

It may be said here, that full crops of fine mushrooms are more profitable than anything else that can be grown without the aid of glass. An idea of the process is afforded in the illustrations, which are not fanciful sketches, but actual lessons from life.

Fruit.

Preparation of the soil and the cost of planting a mixed plantation of dwarf bush and pyramid trees has been estimated at £60 per acre, or £65 with currants and gooseberries between the trees. Such trees are planted from four to twelve feet apart. The planting, staking, and making tall guards to orchard trees on grass thirty feet apart costs £15 per acre.

Mr. Cecil Hooper's table may be given in part here as affording some data for calculation. He states the yield of an acre of plums to be seven tons, price per ton £16 : gross return per acre, £112. Cherries four tons, price per ton £25 ; gross returns per acre, £100. Apples six tons ; per ton, £10 ; gross returns per acre, £60. Pears two tons ; price per ton, £10 ; gross returns per acre, £20. These are not the prices of particular crops in a given year, but are calculations based upon general returns over a series of years in Kent.

Some returns to hand of the profits of bush trees, *i.e.*, apples of bush form grafted on the Paradise stock, show that three years from the planting time the trees began bearing and the yield gradually increased as the trees gained size till in the tenth year from the planting the return amounted to £40 per acre, or a clear gain of £30 per acre. Examples might be given of much higher amounts having been received under exceptional conditions, but our aim is to keep such statements well within due bounds and not to mislead by sensational quotations which serve no practical purpose.

Pruning.—Pruning after planting was referred to in Lecture VI. (page 95). Shortening the branches is done for producing others—increasing the number

of shoots. Two or three of these push from each shortened branch. In two or three years the tree has sufficient branches, and cutting these back would

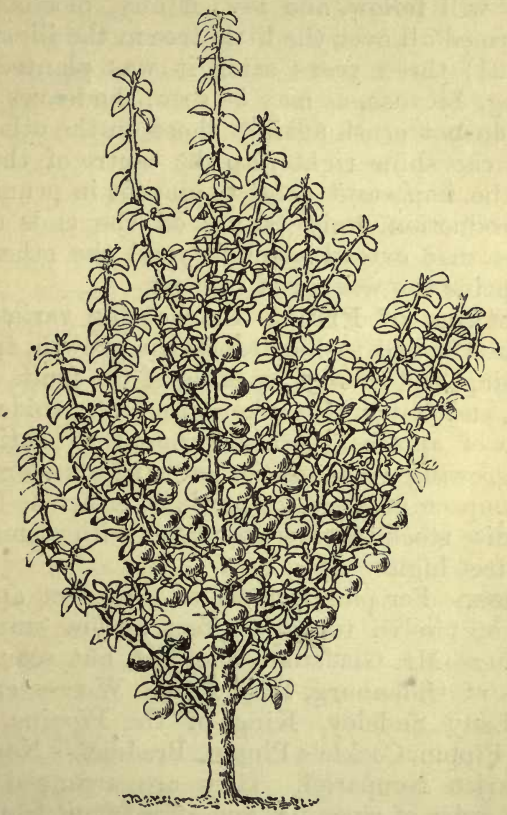

FIG. 32.—OPEN BUSH APPLE TREE (see next page).

result in more—too many. The chief object of the cultivator should be centred in keeping the branches thinly disposed by thinning out any in summer that

threaten to cause overcrowding. If he can pass his hat between the main branches, all the better. Blossom buds will then form all over them, but if they are closely cut back every year a thicket of growths will follow, and few, if any, blossom buds. They formed all over the little tree in the illustration (page 121) three years after it was planted, fruit following, because, as may be seen, the leaves of one branch do not crush against those on the others but the sun can shine right into the centre of the tree; that is the important point to aim for in pruning for fruit production, only taking off the ends of any branches that extend much beyond the others, and thus deprive the weaker of support.

Selections of Fruit.—In choosing varieties, regard must be had to healthiness in growth, freedom of cropping, and time of ripening of the fruit. Trees delicate and liable to canker are best avoided. In the case of apples it is also prudent to distinguish strong growing varieties for orchard standards and more compact growers for gardens, either as bushes, on paradise stocks, or low standards with stems three or four feet high.

Apples.—For planting, six to nine feet apart as bushes, or twelve to fifteen feet as low standards. *For eating*—Mr. Gladstone, the first, but soon over; Duchess of Oldenburg, Irish Peach, Worcester Pearmain, Lady Sudeley, King of the Pippins, Cox's Orange Pippin, Cockle's Pippin, Braddick's Nonpareil and Scarlet Nonpareil. They are arranged somewhat in order of ripening, and afford fruit from July to June. Cox's Orange Pippin is the richest in flavour and the best of all table apples for Christmas. *For cooking*—Mank's Codlin, Potts' Seedling, Cellini, Stirling Castle, Frogmore Prolific, New Hawthornden, Jolly Beggar, Betty Geeson, Seaton House,

and Lane's Prince Albert. The first, fourth, and last are early and great bearers, if only three sorts are needed. For planting twelve to fifteen feet apart, for large bushes on dwarfing stocks, or as tall standards thirty feet apart, Lord Grosvenor, Ecklinville, Warner's King, Beauty of Kent, Golden Noble, Bramley's Seedling—all cooking varieties.

Pears.—These are less profitable than apples. Those selected by the Fruit Committee of the Royal Horticultural Society as the most useful are Jargonelle, Beurré d'Amanlis, Williams' Bon Chrêtien, Louise Bonne of Jersey, Marie Louise, Durondeau, Pitmaston Duchess (the largest), and Doyenné du Comice, which ripen somewhat in the order named. For stewing—Catillac.

Plums.—For high quality, Early Transparent Gage, Green Gage, and Belgian Purple. For cooking and profit, Rivers' Early Prolific, the Czar, Victoria, and Rivers' Monarch. If one tree only is wanted—Victoria. *Damsons*—Crittenden for early productiveness, Bradley's King for high quality.

Cherries.—If only a few trees are grown they must be netted, or birds will take all the fruit. Early Rivers, Elton, and Black Eagle are good for dessert; the Kentish and Morello for cooking.

Of the different kinds of fruits alluded to in this discourse, apples and plums are the most important, as forming part of the dietary of the people. As the demand increases so must the fruit supply, and if this is of the best character through the best culture, and offered for sale in the best condition, there is not likely to be any lack of purchasers at prices that will be fairly remunerative to the grower; but inferior samples will in the course of a very few years not be worth gathering and sending to market, for they will be entirely superseded by the produce

of the healthy young trees that have been planted so freely during the past few years, provided these are well managed and supported on the lines indicated in these lectures.

QUESTIONS AND ANSWERS.

Q. Do you not think that the great increase in fruit plantations will reduce the selling value of fruit?

A. It will not do so materially, and the increased crops resulting from good culture, and the increased demand that always follows on slight reductions in price with better goods into the bargain, will afford compensation.

Q. Which kind of fruit do you consider the most profitable to grow?

A. That is a question to which no definite reply can be given, because the crops of the different kinds vary according to the seasons. Sometimes apples fail when small fruits are plentiful, and occasionally, but less frequently, the reverse is the case. With a judicious selection of the different kinds, adapted to the soil and district, it will be very extraordinary if they all fail.

Q. Then you consider mixed culture the safest line to adopt; is that so?

A. It is. During upwards of forty years experience I have not known a well-planted and well-managed fruit garden by any means fruitless. I have known every crop fail in turn through some cause or other, but never all fail together, and I do not expect ever to witness such a calamity.

Q. Are we to understand, then, that the best possible management cannot prevent failure?

A. You are distinctly to understand it in the case of outdoor culture. The grain harvest fails during prolonged wet weather at a critical time, and ships are lost in storms. When such calamities can be averted then will constant fruit crops of all the different kinds be insured, and not till then.

Q. Are fruit crops practically safe under glass?

A. They rarely fail in suitable structures under the management of careful and competent men.

Q. Much fruit is imported from America and other countries; Apples for instance. Do the crops fail there?

A. Certainly they do, and the importations vary enormously in consequence. There is no valid reason why we should not send fruit to other countries—especially in the form of jam—equal in value to that which they send to us, of such hardy kinds as are grown in this country.

Q. Then do you advise the growth of small fruits in preference to large?

A. No, not in preference, but in addition to them. I mean by the allusion to jam, that nowhere, so far I know, are small fruits grown so well as in the United Kingdom, and as we have the cheapest and best of sugar we ought to develop a large export trade; but we must grow apples. We have the market to ourselves till November, and then again in spring. The early and late varieties are, therefore, likely to meet with the best sale; that is, before the American cargoes arrive, and after they are exhausted. Early autumn apples of home growth have never been so plentiful as during the present year, never so fine, and good samples never commanded better prices.

Q. Which fruits are generally the best for strong soil?

A. Broadly speaking plums and black currants, though some of the robust growing apples answer well in heavy land if it is drained, such as Lord Grosvenor, summer; Ecklinville, autumn; and Bramley's Seedling, spring. Strawberries also answer very well if a little light soil can be placed round the roots when planting to give them a quick start into growth.

Q. About potatoes. Is it a good plan to cut off the tops after the disease strikes them?

A. It does very little good when they are blackened; but if they are promptly pulled up—standing on the ridges and grasping the stems with the feet—on the very first disease specks being visible, then casting some more soil on the ridges, benefit may result to the crop.

Q. Is it a good plan to let potatoes remain on the ground for several days to become green before storing?

A. It is not. It spoils them for use and does not protect them from the disease. They should be carefully sorted and stored as soon as they are perfectly dry, then the cooler they are kept the better, provided they are safe from frost. If damp and in thick heaps fermentation is liable to occur, then the disease spreads through the mass with ruinous rapidity.

Q. Instructions on the cultivation of most kinds of crops have been given; can a little more be said on growing two of the kinds alluded to in the lecture—tomatoes and mushrooms. Can they be grown without the shelter of glass?

A. Tomato plants must be raised under glass in order to have

them early enough for producing and ripening crops in the open air; but mushrooms need no glass to shelter them, though they are often grown successfully in glass structures in winter.

Q. Taking tomatoes first, what are the chief essentials of their culture?

A. Stout plants (page 118), produced by thin sowing in a temperature of about 55°, and having them gradually hardened for planting in warm positions early in June.

Q. Will they succeed in the open, or must they be trained to walls and fences?

A. Many tons of ripe fruit have been produced in the open during warm summers, but the crops are more certain from plants trained to walls or fences facing the south. In the open the plants are grown three or four feet apart, each supported by a stake. When they produce four or five trusses of fruit the tops are taken off the plants and all subsequent growths are pinched off before they are two inches long, leaving only the fruit trusses and the leaves on the main stem. On walls the plants may grow taller, but all the side growths are pinched just the same.

Q. Is the treatment under glass conducted on the same lines?

A. Yes, precisely the same, only the plants are grown a foot or two closer, also allowed to extend to the limits of the roof or space, and are watered as needed. They like firm, fresh loam, not a rich deep-rooting medium, and manure may be applied to the surface of the soil when the crops are swelling. They are liable to be attacked by disease the same as potatoes, and the same applications are useful—Bordeaux mixture and Anti-Blight (page 83), if applied soon enough—as preventives.

Q. Will you please name a few good varieties of tomatoes?

A. New ones are being constantly raised. Sutton's Earliest of All and Saxton's Early are good for the open air; Perfection, Challenger, Ham Green Favourite, and Golden Queen for culture under glass. Full cultural details are given in Iggulden's *Manual*, 1*s.*, 171, Fleet-street.

Q. Now be good enough to tell us how mushrooms are raised and grown.

A. They are raised from "spawn," which is bought from seedsmen. The bricks are broken into eight or ten pieces, and these are forced in very firm beds of partially-decayed fermenting manure from horse stables. The warmth causes the spawn to "run"—the myceliun (page 119) to spread. The beds are cased with soil beaten hard down to an inch or two thick, then covered with litter to prevent the moisture escaping from them. Flat

beds are made in sheds, or under the stages of greenhouses in winter where drip does not fall on them from plants above. Mushrooms are also extensively and profitably grown on ridges and mounds in the open air, thickly covered with litter.

Q. Can mushrooms be really grown with profit in the open air?

A. Certainly. They are so grown in enormous quantities by market gardeners, who collect manure from horse stables late in summer and during the autumn. After it has fermented and been sweetened by turning over, it is beaten firmly into ridges about three feet wide at the base and the same in height, with the top rounded. Lumps of spawn are pressed in about eight inches apart, a covering of good soil given and beaten down, then sufficient litter to keep moisture and a gentle warmth in the ridges. Miles of such covered ridges are formed yearly, and tons of mushrooms grown. Full crops are highly remunerative.

Q. When is a good time for making the beds, and what temperature is suitable for growing the crops?

A. Taking the last question first, a temperature ranging between 50° and 60° is the best, therefore it is of small use attempting to grow mushrooms in summer except in the coolest places that can be found. The end of July or beginning of August is a good time to commence collecting manure, which should be turned over at intervals of four or five days to sweeten, damping it if in the least dry. In about three weeks it will be ready for use, and must be beaten down as firmly as possible; in another week it will be ready for spawning, a week after that for casing with soil, then if covered and kept moist mushrooms may appear in six or eight weeks, and good beds remain productive for two or three months. The whole details for cultivation, both indoors and out, are given in *Mushrooms for the Million*, 1*s.*, 171, Fleet Street.

LECTURE IX

THE PRESERVATION AND DISPOSAL OF GARDEN PRODUCE

To the grower of fruits, vegetables, or flowers for sale, the subject of this lecture is of the highest importance, for no part of his business requires more care, close personal supervision, and knowledge than this. Even the small cottage-gardener may occasionally find he has more of some kinds of fruit or vegetables than can be consumed at home, and a knowledge of the best methods of preservation or disposal of these will be to his advantage.

Fruit.

Hundreds of tons of good fruit are now annually converted into jam in this country, factories specially designed for the purpose being fitted with all necessary appliances, and the manufacture carried out on the best known scientific principles; but however cheaply good jams and jellies may be produced in these factories, householders will generally prefer a home-grown and home-made supply.

Gathering Soft Fruit.—*Strawberries.*—All fruit, of whatever kind, intended for the purpose in

question must be gathered when quite dry. Strawberries should be ripe when gathered, but not overripe; they ought to be firm and bright. When too ripe they become soft to the touch, and assume a dull, dark colour. They are best gathered with stalks attached, from half an inch to an inch in length, for dessert, but many are gathered without for preserving. All fruits should be clean, all that are damaged being rigidly excluded.

Raspberries should be gathered with stalks attached only when they are required for dessert. For all culinary purposes they are gathered without stalks. This should be done whilst the fruits are still firm to the touch. When ripe, or nearly so, they are very absorbent of water, hence, after continued rains, are not in a fit condition for preserving, and should then be used either for making raspberry vinegar or for cookery. The fruits ripen very quickly when they reach a certain stage, and to secure them in the best condition they should be gathered immediately they are ready.

Currants, both red and white, are gathered with the stalks, and the fruit afterwards handpicked from them; but black currants are preferably picked without stalks from the bushes, for the reason that the uppermost and finest berries on each stalk often ripen a week before the lower ones. The best fruits would thus be lost if allowed to wait for the whole bunch becoming ripe. The bushes should therefore be picked over several times, at intervals of three or four days, taking the ripest berries in each case, and leaving the stalks. Currants in all cases require to be fully ripe before being gathered for any purpose. Red and white currants will hang upon the trees in good condition for a long time if protected from birds by netting or mats, and it is no uncommon thing for

gardeners to exhibit dishes of fruit in good condition as late as November.

Gathering Large Fruits.—To gather *Apples* and *Pears* at the proper time requires some knowledge of the varieties. It is a great mistake to gather them before they are fully developed, as in that case they shrivel instead of ripening. A tolerably safe guide in this matter is to cut open an average fruit and note the colour of the pips or seeds. When the fruit is ripe these are of a reddish-brown colour, but until ripening commences they are nearly white. The pips of apples should have nearly completed this change of colour before the fruit is gathered. It ought to come off the tree easily without any twisting. Pears may be gathered soon after the change commences.

Care ought always to be exercised to avoid bruising fruit in gathering. This is often unwittingly and thoughtlessly done in grasping too many at once. Two fruits are held whilst a third is grasped; the pressure of this against the others bruises all three. Also in placing them in the basket, it seems almost needless to say that they ought not to be thrown in, but this is too frequently done, and is the best way to spoil fruit.

Care must also be exercised in pulling the fruits, not to bring away the buds at the base of the stalks. To obviate this, take the fruit in the palm of the hand, placing the thumb and forefinger around its stalk, with the thumb-nail pressing slightly against the point where separation should take place; then slightly raise the fruit, and it will part as freely as desired, if sufficiently ripe for gathering. If separation is not easy, the gathering should be delayed.

Packing.—For sending apples, pears, and plums into market, nothing has yet been invented at home which supersedes the ordinary market baskets, known

as bushels, half sieves, flats, half flats, and pecks (page 137). Before being packed the fruit should be sorted into large and small, or best and seconds, and ought to be of one quality throughout, the same at the bottom as at the top. This gives confidence to buyers and thus better prices are obtained. The baskets must not be quite filled, space having to be left for the covering, which should consist of a sheet of paper and over this a layer of straw or fern. As a rule small packages are best and least injurious to the fruit.

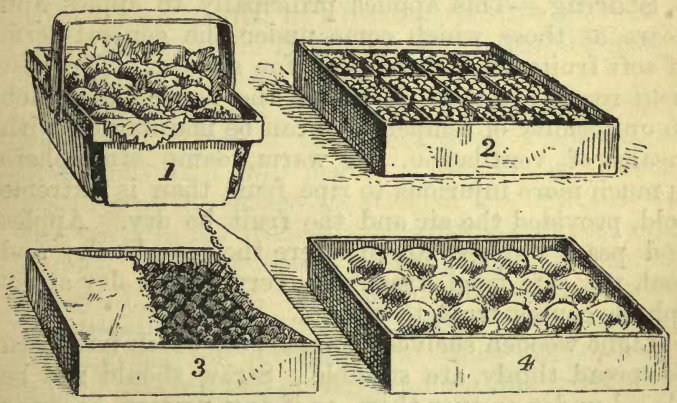

FIG. 33.—PACKING STRAWBERRIES, PLUMS AND PEARS.

1, Strawberries in chip baskets; 2, baskets (reduced) with handles turned down and arranged in box for transit; 3, choice plums assorted and covered with lace-edged paper; 4, assorted specimen pears.

Strawberries are best packed in punnets, each holding about one pound, and the best form of these is the square with folding cross handle as shown in the above illustration. These are taken to the beds and the fruit placed in them direct as gathered. They are then weighed, the handles turned down, and the punnets packed closely together in

boxes or trays as shown. In this way they are carried to market, and thus receive a minimum of injury from handling and shaking. Many tons of strawberries are, however, despatched from Kent to markets in all parts of the country, packed in the baskets known as pecks and half-flats. Raspberries are sent to market in tins broadest at the base, also earthenware vessels, the latter being known in the potteries as half-pippins and holding twelve pounds of fruit. Currants are usually packed in flats and half-flats, whilst gooseberries are packed in sieves and pecks.

Storing.—This applies principally to apples and pears, as those which come under the general term of soft fruits are not adapted for storing. The best fruit rooms are those in which the nearest approach to uniformity of temperature can be maintained with means of ventilation. A warm, damp atmosphere is much more injurious to ripe fruit than is extreme cold, provided the air and the fruit be dry. Apples and pears are best stored where they can be dry and cool, yet safe from frost. A very warm, dry atmosphere causes fruit to shrivel.

Light wooden shelves or racks, on which fruit can be spread thinly, are suitable. Straw should not be placed under or over them, as if any portion becomes damp and mouldy it will impart an unpleasant flavour to the fruit. Apples are particularly liable to have their flavour impaired by obnoxious surroundings; even a tainted atmosphere will suffice to spoil their quality.

Choice samples of apples and pears, each wrapped in tissue paper, and placed in a close sweet box or earthenware pippins, in a cool, dry place, keep as long as it is possible to keep them.

Dried Fruit.—All kinds of fruits are dried in America through being subjected to great heat in

"evaporators." Nothing is lost but water, and the dried produce, such as apple "chips," after being soaked in water, regains nearly its original bulk, and all the good properties are retained for cooking. The fruit-drying industry has attained enormous proportions in America. In one year 5,000,000 bushels of green apples were dried, 200,000 tons of water being driven from them by a consumption of 15,000 tons of coal. The chief consuming countries are Germany, England, Belgium, Holland and France. The drying of fruit can be as well done in this country as in America, and small unmarketable samples thus utilised, as is proved by experiments with the "Mayfarth" apparatus in the Royal Horticultural Society's gardens at Chiswick.

Apples cored and sliced may be dried in kitchen ovens, and plums of the firm-fleshed, thick-skinned kinds converted into prunes. Mr. Philip Crowley, treasurer of the society mentioned, has fruit dried on wire trays in his kitchen oven after the day's baking is done, the door being left slightly open for the escape of moisture. His samples are excellent, and cost nothing in the way of fuel. Fruit properly dried keeps for an indefinite time. Apple chips require soaking two or three hours, and dried plums five or six hours before cooking.

Vegetables.

Potatoes.—The preservation of vegetables for use throughout the winter is important to the cottage as well as to large growers of produce for sale. Firstly, we have the most serviceable vegetable of all—the indispensable potato. As regards all that will be required for table use, the less exposure they have to light and air the better. Such exposure for any con-

siderable time injures their cooking qualities, consequently the old-fashioned plan of burying them in pits (or as they are termed in some counties, "camps") is resorted to. This answers well when properly carried out.

If disease is suspected the tubers ought to be uncovered, and all tainted ones picked out after they have been buried two or three weeks. Through neglect of that simple practice, many tons of potatoes have been wholly destroyed which might have been saved.

Another precaution necessary is to guard against injury from frost. When sharp frosts are expected, a foot or more in thickness of long strawy stable litter, bracken, or other such light material should be placed over the earth covering. This will be found much more effectual in resisting frost than would an additional layer of soil. Potatoes buried under soil alone, two feet in thickness, have been destroyed by frost when a straw covering as above indicated would have saved them.

Various Roots.—Carrots, parsnips, beet, turnips, artichokes, and other such roots, are best preserved through the winter months packed in dry sand in a cool shed, or in a cellar.

Onions keep the best when formed into what are known as "ropes," by plaiting or binding them upon straw, and suspending them in a thoroughly cool, airy and dry place. Frost will not injure them if they are kept quite dry.

Green Vegetables.—*Cauliflowers* that form small close heads just before winter may be preserved almost until Christmas by lifting the plants (before they are injured by frost) with a spade so that earth adheres to their roots, and packing them closely together on the floor of a shed, or even against a wall

outside or under trees, where they can have protection from sharp frosts by covering with straw or leaves where these are obtainable.

Brussels Sprouts.—To preserve these in good condition through the winter all yellow decaying leaves should be picked off at intervals, and on no account should the small cabbage-like head at the summit of the stalk be cut off until the supply of sprouts below it is exhausted. So long as it remains it affords protection to the sprouts, and helps the smaller and latest ones at the top to develop more fully.

Spring Broccoli if partly dug up on the approach of frosty weather and laid down so that the heads lie almost flat upon the ground, with soil banked thickly over the stems up to the hearts, are not nearly so likely to be destroyed by frosts as they would be if left standing upright. The plants are best slanted to the north or west.

Celery should be shielded from frost by covering the ridges with straw, bracken, or any long litter. Or at the commencement of what seems likely to be severe frosty weather, it may be taken up and stored in sand, as recommended for root crops. A grower for sale adopted this plan with a large quantity at the commencement of a long and severe winter, and at the end of the frost he had command of the market, all the stocks of other growers having been destroyed. His consequently realised high prices, selling freely at sixpence per stick. Another cultivator lost eighty acres, valued at upwards of £2,000, the same year through want of protection.

Flowers.

Turning to the preservation of flowers, these cannot be kept in good condition for such long periods as vegetables. Still much may be done to prolong

their freshness, and a knowledge of the best methods is desirable. Firstly, all flowers (excepting those known as everlastings) which have to be sent long journeys, or to markets, should be gathered in the early morning, before the sun takes from them the crispness acquired during the night. Also, it is important that they be, in nearly every case, gathered before being fully expanded. Especially is this necessary with roses.

For market purposes these are gathered when not more than half expanded, and immediately packed closely together in shallow boxes, having close-fitting lids, which makes them nearly air-tight. The mode of packing adopted is as follows:—A thin layer of damp moss is spread in the box and over this a sheet of tissue paper, also damped. A row of roses, fitting closely against each other, is then laid across the end of the box, and over the back of this row a strip of folded tissue paper; then another row of flowers and another strip of dividing paper, and so on, a larger strip being laid over the stems of the last row. A sheet of blue tissue is placed over the whole and the lid shut down. In this simple manner they will keep uninjured for a week. The reason why they do so is because they are not exposed to the air.

Flowers in Glasses for room decoration should have fresh water, and about half an inch cut from the base of the stems every third or fourth day. No leaves should be on the stems that are in the water. Flowers which have shrivelled through unsuitable packing or other causes, may in most cases be quickly revived by placing their stems in hot water—*i.e.*, water at 112 to 120 degrees, or as hot as the hand can be borne in it—for ten seconds.

Marketing.

Good produce, whether of fruit, flowers, or vegetables, well grown, carefully sorted and packed, and tastefully displayed, will always find a ready sale. When the supply of any article exceeds the demand, it is that portion which is of inferior quality and badly displayed, that lacks purchasers, or, if sold, it

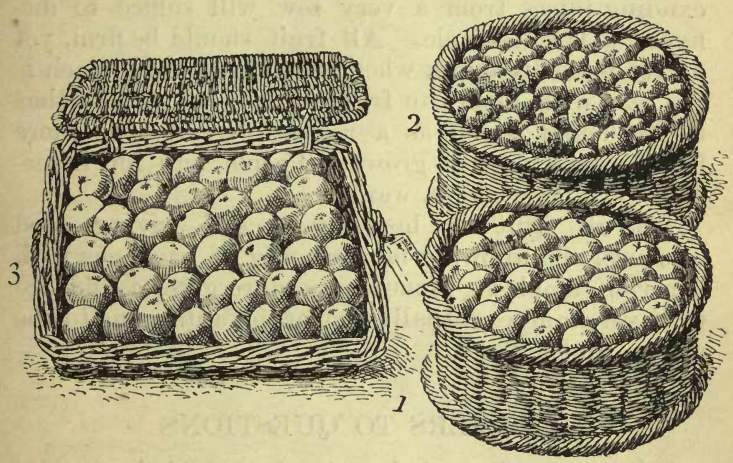

FIG. 34.—PACKING APPLES.

1. Sieve, fruit sorted—good sample 2. Fruit mixed—bad sample. 3. A "flat"—sorted fruit. The baskets should be lined with blue packing paper, leaving sufficient to draw over and cover the fruit.

must needs be at a great reduction in price, leaving little or no profit to the grower.

A few general remarks regarding marketing garden produce may fitly conclude this lecture. All roots, such as potatoes, turnips, carrots, parsnips, and the like, should, when sent to market, be dry, good in colour, and as near as possible free from dirt, but not washed. They should be sorted to secure some uni-

formity in size, and all diseased or otherwise damaged specimens must be discarded. Fruit should be dry, clean, and bright in appearance. Apples are much improved in the latter respect by rubbing each one separately and lightly with a soft cloth. All bruised, broken, or decaying specimens must be taken out, and, as previously stated, they should be assorted as to size. In plums and other soft fruits it is especially needful to reject all damaged specimens, as the exuding juices from a very few will suffice to disfigure a large sample. All fruit should be firm, yet fit for immediate use, when sent to market. Such is the case with American fruit when received, and that is frequently given as a reason why it sells more freely than English grown. People buy for immediate, not prospective, wants.

Let all fruit be honestly packed, giving good measure, and allowing no surfacing of packages with superior samples. Honest procedure gives confidence to buyers, and eventually proves advantageous to the grower and seller.

ANSWERS TO QUESTIONS

The only questions asked at the close of this lecture that elicited replies of general interest were those in relation to baskets and other measures for sending produce to market. The following articles are generally employed in Covent Garden :—

MARKET FRUIT AND VEGETABLE MEASURES

These, being often made either of osier or deal shavings, vary triflingly in size more than measures made of less flexible materials.

SEAKALE PUNNETS.—Eight inches diameter at the top, seven and a half inches at the bottom, and two inches deep.

RADISH PUNNETS.—Eight inches in diameter and one inch deep, if to hold six hands ; or nine inches by one inch for twelve hands.

MUSHROOM PUNNETS.—Seven inches by one inch.

SALADING PUNNETS.—Five inches by two inches.

HALF SIEVE.—Contains three and a half imperial gallons. It averages twelve and a half inches in diameter and six inches in depth.

SIEVE.—Contains seven imperial gallons. Diameter fifteen inches, depth eight inches. A sieve of peas is equal to one bushel; a sieve of currants to twenty quarts.

BUSHEL SIEVE.—Ten and a half imperial gallons. Diameter at top seventeen inches and three quarters, at bottom seventeen inches; depth eleven inches and a quarter.

BUSHEL BASKET.—Ought, when heaped, to contain an imperial bushel. Diameter at bottom ten inches, at top fourteen inches and a half; depth seventeen inches. Walnuts, nuts, apples, and potatoes are sold by this measure. A bushel of the last-named cleansed weighs 56 lb., but four pounds additional are allowed if they are not washed. A junk contains two-thirds of a bushel.

BUSHEL FLAT.—Length 21 inches, width 16 inches, depth 10 inches, inside measure.

POTTLE.—Is a long tapering basket that holds rather over a pint and a half. A pottle of strawberries should hold half a gallon, but never holds more than one quart; a pottle of mushrooms should weigh one pound.

HAND.—Applies to a bunch of radishes, which contains from 12 to 30, or more, according to the season.

BUNDLE.—Contains 6 to 20 heads of broccoli, celery, &c.; seakale 13 to 18 heads; rhubarb 20 to 30 stems, according to size; and of asparagus from 100 to 125.

BUNCH.—Is applied to herbs, &c., and varies much in size, according to the season. A bunch of turnips is 20 to 25; of carrots 36 to 40; of greens as many as can be tied together by the roots.

Grapes are put up in 2 lb. and 4 lb. punnets; new potatoes by the London growers in 2 lb. punnets. Apples and pears are put in bushels, sieves, or half sieves. A hundredweight of Kentish filberts is 104 lb. Weights are always 16 oz. to the pound.

In Worcestershire fruit is measured by the POT and the KIPE. Both are wicker baskets. The pot is of an oblong shape, being 12 inches long, 14 inches wide, and 15 inches deep. The kipe is round, 1 foot wide at the bottom, 18 inches at the top, and 12 inches deep.

LECTURE X

ENCOURAGEMENT AND ENDEAVOUR.—HIGH IDEALS IN GARDENING.

All past experience proves that encouragement given for excellence in production in the form of prizes to the most successful workers has led to higher standards of excellence being established. This is the direct outcome of emulation and ever increasing numbers striving for superiority. Exhibitions of various kinds, whether of manufactured goods or farm and garden produce, have had a stimulating effect in giving impulse to endeavour and impelling both brain-workers and handicraftsmen to excel in the work in which they were engaged.

This is as it should be, and in no pursuit have greater advances been made during the past few years than in gardening.

The way in which prizes are won for fruit is by planting young trees of the best varieties in deep, good, well-worked soil; not crowding the branches but keeping the bushes open; thinning the fruit to nine inches or more apart; dressing the ground over the roots thickly with manure, giving a pailful of liquid manure now and then when the crop is swelling; keeping the growths free from insects; and when the fruits are ready for gathering, handling

them with the greatest care, as they are much more easily spoiled than eggs are by tumbling them about roughly.

Not in fruit alone but in vegetable culture is great progress apparent, and some cottagers grow and show vegetables in very high-class condition, in many cases nearly if not quite equal to the produce exhibited by professional gardeners.

Thin sowing, thin growing, deep digging, rich moist soil; neatly trimming vegetables and washing roots, then arranging the whole tastefully on plates, in flat hampers, or on beds of parsley in trays—is the way to win prizes for vegetables.

Another important method of affording encouragement to workers is to create wholesome pleasant rivalry amongst them by offering prizes for the best-kept and best-cropped gardens or allotments in parishes or districts.

Few engagements can be more interesting than those in which a number of busy workers strive each to excel the other in the management of plots of ground, and than neat, well-tilled, well-cropped gardens, it is not easy to conceive of anything more commendable, pleasurable and useful.

Where the custom has been in operation for a few years of granting awards for superior culture, there is not the slightest doubt that the productiveness of many gardens has been increased three-fold; indeed, viewed in comparison with others to which little thought has been devoted, or labour invested, the increase is relatively much more than that.

The Beddington and Carshalton Society, which Mr. A. H. Smee, C.C., supports so well, commenced giving prizes for gardens and plots; in two years the effect was seen all over the district in the far greater number of better managed plots and fuller and

cleaner crops. The plan is also adopted in many other districts of the country with gratifying results.

As this form of stimulating to greater effort in the cultivation of the soil is bound to spread, and may possibly become somewhat general, it is desirable that all who are interested in the subject should be acquainted with the principles and methods on which judging is conducted. The following plan has been found satisfactory, and has been distributed amongst cottagers and allotment holders in the Carshalton district.

JUDGING COTTAGE GARDENS AND ALLOTMENTS

1.—For placing small plots on an equality with large, the MERITS *only*, *not* the BULK, of the crops are considered.

2.—The value of each crop is set down in points.

3.—The standard of merit is represented as follows :—

	Maximum Points
For general cleanliness and good order	10
For Potatoes	10
For cultivated Hardy Fruits (not worthless old trees)	10
For Peas, Broad Beans, Runner and Dwarf Kidney Beans, Cabbages (Cooking), Cauliflowers, Winter Greens (Savoys, Brussels Sprouts, Kale, and Broccoli), Onions, Turnips, Carrots, Parsnips, Vegetable Marrows, and Rhubarb, each	8
For Artichokes (tuberous), Beet, Cabbage (Red), Celery, Cucumbers, Leeks, Lettuce, Shallots, Radishes, Tomatoes, and Spinach . . . each	6
For Mustard and Cress, Herbs (including Parsley, Mint, Sage, &c.), Horse-radish, and any things not enumerated . . . . . each	4

NOTE.—The *greater* the *variety* of vegetables grown *well*, the greater the number of points recorded, but the minor sorts, as counting the least, should only be grown to a small extent ; the more useful in larger quantities, not only because these count more, but because they are more serviceable.

FLOWER GARDENS.

	Maximum Points
In judging these, points are given for order and neatness	10
For good arrangement and general effect . . .	10
For noteworthy hardy flowers	8
For meritorious tender flowers	8
For special features, such as vases, hanging-plants, ferns, &c. . . . . each	6

WINDOW AND WINDOW-SILL DECORATION.

For cultivation and quality of plants	10
For tasteful arrangement	10

N.B.—When flowers are judged *with* vegetables the former are appraised from the 8 point standard.

J. WRIGHT, }
G. GORDON, } *Judges.*
G. W. CUMMINS, *Hon. Secretary.*

It will be seen that cleanliness and good order are regarded as most important; that potatoes are held to rank in value above all other vegetables; that full encouragement is given to the production of hardy fruit; and that rivalry is incited amongst the villagers to render their cottages and gardens attractive by the cultivation of flowers, the love for which is extending and the cultivation increasing among all classes of the community.

The art of cultivation, or increasing the productiveness of the soil, and thus creating a better supply of what is wholesome, and surrounding homes with more sweetness and beauty than pertains to many, can only be acquired by close attention, and a love of the subject on which instruction is sought to be conveyed. Our wish is that a love of gardening shall be incited in those who have not yet felt its usefulness and its charms; and deepened and intensified

in those who have experienced its benefits and good influences. Our desire is that this interest which becomes active, shall impel to steady and continuous endeavour in aiding the earth to yield its full increase; and when the art is fully acquired and generally exercised, this native land of ours ought, and we believe will, become one of the most fertile spots on earth, and win the proud title of the garden of the world.

Even now with ordinary methods of working, the average return per acre of our useful crops of grain and roots is greater than in any other kingdom in Europe or State in America. That is a significant fact and distinctly encouraging.

Our ideal, then, high as it is, is attainable. Our natural advantages are great, and artificial obstacles will steadily vanish, seeing there is now such a great desire among the different sections of the community for the development of the resources of the country for the good of all. In this work, and with that object, the Surrey County Council has taken a noble lead, and it is earnestly to be hoped results will eventually be produced that will justify their action.

Let us now recapitulate in the form of a brief summary some of the chief points in these lectures.

The advantages of *deepening the soil* have been explained. The food store is then increased, and right and wrong methods of increasing it were described, in smashing up the subsoil, but not bringing much to the surface at once.

It should not be forgotten that the importance of keeping a loose surface by *hoeing* in spring and summer was strongly enforced—in spring, for admitting warmth from the sun; in summer, for preventing the escape of moisture by evaporation. It is impossible to attach too much importance to the use

of the hoe, both for preventing weeds and stimulating the growth of useful crops. The man who despises or underrates the use of the hoe can never be a good gardener—a master in the art of cultivation.

Good seeds, thin sowing and early thinning of plants to prevent crowding, have been pointed out as prime essentials in cultivation. Think of these

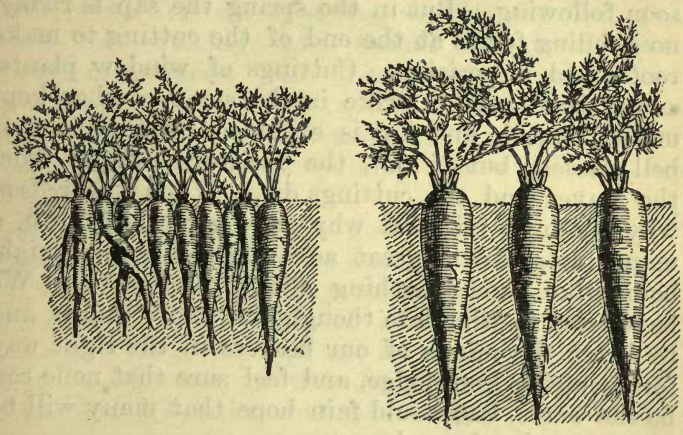

FIG. 35.—A LESSON IN THINNING.

Crowded and spoiled, thinned and profitable. This applies to all root and green crops.

things—of the value of stout, sturdy, well-rooted, and well-set plants on the one hand, and of the comparative worthlessness of drawn-up weaklings, stuck into the ground with scarcely any roots, on the other. (See page 100.) We say think of these things, but also *act*, abandoning wrong, and choosing right methods, as being the cheaper, better, and more

profitable course, indeed, the only course by which the most satisfactory results can be achieved.

The subject of *raising plants and trees* from cuttings, and in other ways, has had attention, and it is well to remember the reason why such cuttings as currants, gooseberries, and, in fact, all trees, root better when inserted in the autumn than in spring. In the autumn the sap is *sinking*, and forms a swelling at the end of the cutting in the ground, roots soon following. But in the spring the sap is *rising*, no swelling forms at the end of the cutting to make roots, and it perishes. Cuttings of window plants, as has been stated, strike in the summer when kept moist, shaded, and air is excluded by tumblers or bell-glasses; but if not, the moisture escapes from the leaves and the cuttings die. When the *reason* why cuttings fail and why they grow is known, a man starts with a great advantage over his neighbour who knows nothing about the matter. We have tried to stimulate thought on many things, and to direct the minds of our hearers in the right way for acquiring knowledge, and feel sure that none can be the worse, but would fain hope that many will be the better, by the endeavour.

It has not only been pointed out that plants and crops need *food in the soil*, but the chief kinds of food have been stated. These are three: Nitrogen, that originally comes from the air; Potash, that is plentiful in wood-ashes; and Phosphates, found in bones; with lime as a solvent and food staple. It is because good stable manure contains those three kinds of plant food that it is valuable, and if they have been lost by overheating, or their juices have been drained away, the so-called manure is of little use—a sort of husk, "a dead body from which the spirit has flown." No such waste should

be permitted, nor should household slops, as these given to trees and crops do good, and, if thrown on manure heaps, make them richer.

When there is no manure-heap plant food can be placed in the soil by (1) superphosphate, bonemeal, or basic slag (that give phosphates and lime); (2) kainit or wood-ashes (that give potash); and (3) nitrate of soda, or sulphate of ammonia (that give nitrogen). The kinds 1 and 2 dissolve slowly, and should be given when (or before) sowing or planting, but the others act quickly, and should be given after growth commences. An ounce of either of the latter to the square yard, and twice the quantity of the other two kinds, would benefit all crops in need of support, provided weeds were not allowed to steal the food applied.

Now passing to fruit; a good deal has been said about the pruning of trees, and keeping them clean. The point to remember in pruning is not to let trees and bushes be choked with a crowd of shoots in summer. It is the full action of the air on the leaves at the base of the shoots that makes trees fruitful in character, and they cannot be so if the leaves are thin and weak by overcrowding. Bearing that in mind, it will be seen that much more good may often, if not always, be done by thinning trees in summer, than by cutting back the shoots in winter.

Some examples of success in growing fruit and other crops have been given—of an allotment-holder named Collins, for instance, turning his half acre to such splendid account by growing strawberries and raspberries in Kent. Scores of men have made a profit of £30 an acre with strawberries in Hampshire, 1,500 acres being grown in one district, and 60 tons sent from one station (Botley) in a day.

Then there is that thrifty allotment-holder at Pet-

worth, Mr. Wm. Jacob, and this is what he says in a letter :—"The field of allotments, of which my garden forms part, has fifteen tenants. The landlord worked it as a corn field, but could not make it pay, so made it into gardens of about 40 rods each—a quarter of an acre. The land now gives a rental of nearly £35 a year to the landlord, and yields fruit and vegetables valued at £400. I gave £5 10s. for 75 rods, but it

FIG. 36.—RAISING AND PLANTING STRAWBERRIES.

Central example, raising plants from runners pegged in turves and pots. Left and right examples represent bad and good planting: bad, few roots doubled in: good, many roots spread out in the soil. Plants in pots or turves only need the roots slightly liberated and very little soil removed from them in planting.

is in the best position. I have taken 200 prizes at shows, winning between £4 and £5 a year; and visitors from all parts say my plot is the most productive in Britain."

That shows what can be done by able and earnest workers, and this man pays rent at the rate of £11 an acre without a murmur, making a great deal more profit out of the land than most men do out of plots for which they do not pay a quarter the rent.

And so we might go on, but time goes too. Some persons delight in flowers and make money by them. From £5,000 to £6,000 worth a day are sold in London, or £30,000 worth a week. But apart from that, nothing better indicates the presence of thought, thrift, refinement, and love of home than flowers, few or many, where they can be grown about the dwell-

FIG. 37.—GATHERING AND WEIGHING STRAWBERRIES NEAR SWANLEY, KENT.

ings of the people. In the so-called "paradise of small holdings" in Belgium the homes are flowerless and miserable-looking; men, women, children and dogs, yoked to barrows, slave on the land from dawn till dark, in a way we should not like to see around the village homes of England.

Another word about fruit, to introduce a busy scene

of strawberry picking and weighing in Kent. The scene is enlarged from a photograph, and is therefore exact. It is clear that fruit-growing affords work for workers on the land. As showing the extent of the culture, 78 tons were sent in one day from Swanley station, and 605 tons in 97,000 baskets of fourteen pounds each, or 1,358,000 pounds of strawberries from one station in one month—July, 1891. Yet there are pessimists, mostly failures in working, who preach the miserable doctrine that this grand old country is worn out! It is just awakening to a sense of the need and duty of better work and greater effort for developing its resources.

Let us all, then, do our best and not rest satisfied till we have done our share in making England what it may be—the garden of the world; and workers on the land, as they should be, masters in the art of cultivation.

QUESTIONS AND ANSWERS

Q. In judging gardens by points, how is the work conducted?

A. Every crop growing in each garden is noted and its merits estimated and put down in figures. For instance, if potatoes are as good as they can be, and the standard of merit is ten, that number of points is put down, but if only so to say half good only five would be entered, and so on, more or less, according to the condition of the plot. It is the same with all other crops; but as indicated in the list on page 142, some cannot have more than eight, others more than six, and the still less serviceable more than four points, no matter how good the produce may be. Cultivators are thus induced to give the most space to the most useful and the least to the least useful kinds, while a little is devoted to most of the kinds mentioned with any others that may not be included in the list.

Q. In exhibiting produce at shows, are the prizes given to the largest examples?

A. This rarely indeed happens unless the exhibits in a class are too small throughout, and then the quality of those to which prizes are adjudged is fully considered.

Q. Then do you wish us to understand that judges attach more weight to high quality than to individual size of the articles exhibited?

A. That is so, as a rule, and subject to the produce being of good usable size, for of course if anything is too small to be useful that of itself is a fault; but when anything is so overgrown as to degenerate into coarseness it is also a fault which good judges are not likely to overlook.

Q. Can you give briefly a few examples of merits and defects in vegetables as a guide to the inexperienced who may like to exhibit for prizes?

A. Yes: take potatoes: rough, specked, deep-eyed tubers weighing about half a pound each, but irregular in size as well as shape, would have no chance against others about half the size, uniform, shapely, with shallow eyes, also free from spot or blemish. Again, huge carrots, turnips, beet or parsnips with thick fangs jutting out of the sides, and the roots cankered, would be set aside in favour of smaller specimens, straight, smooth, clean and cankerless. A cabbage weighing seven or eight pounds with a hard split heart and caterpillar-eaten leaves would be superseded by one less than half the size but firm, yet fresh and tender-looking, and the surrounding leaves perfect. A cauliflower a foot across, yet yellowish and beginning to open, might perhaps get a third prize, while one as small again, yet close and pure, would easily win the first. Huge pods of peas if hollow, as many are, would be set aside in favour of smaller, if fresh, and full of tender seeds. The largest kidney beans if pale in colour and tough would be quickly placed behind smaller but greener pods as brittle as glass. Big vegetable marrows so hard in the rind as not to yield to pressure by the thumb-nail would not be equal in merit to medium-sized fruits so tender that the skin offers little or no resistance to such pressure. Large thick-necked onions fail in competition with smaller yet good bulbs with thin stems, or no neck worthy of the name. Then when specimens are shown in pairs, or any other numbers, they should be as even in size as possible, as large and small placed together weaken the exhibit. The point to remember is that specimens with the fewest faults win the highest prizes, and this applies to fruits and flowers as well as to vegetables.

Q. Can you point out the best initial steps to take in the formation of Cottage Garden Societies?

A. When cottagers and allotment holders manifest a desire in

this direction there is a great disposition on the part of land-owners, clergymen, and well-to-do residents generally to co-operate, and subscribe what are, to them, small amounts, as honorary members. Tradesmen usually follow the example and in that way a fund is commenced and a committee is elected, officers appointed and rules framed for the conduct of the Society. Ardent amateurs not unfrequently take a lead in this work, and professional gardeners are usually to be found ready to give what aid they can in advising and carrying out the objects the committee have in view.

Q. What are the usual rules and regulations by which these Societies are governed?

A. They vary somewhat according to local circumstances, and the best thing the leaders in the movement can do is to obtain the rules of existing Societies and adopt such of them as may be considered most applicable. Secretaries are always willing to send copies of rules on receipt of stamps for postage. Those of the Society mentioned in the lecture are very good and generally obtainable in return for a penny stamp to defray postage.

Q. One statement in the lecture has caused some surprise—that in which it has been said the average yield of the useful crops mentioned exceeds that of any country in Europe or state in America. Is there no mistake?

A. With only one crop in one country is there any exception—the wheat crop in Holland: in all other useful crops of grains and roots Britain takes the lead in average yields, as may be seen by all who examine the agricultural returns as published by the Government. They can be had from Messrs. Spottiswoode.

Q. You have in the course of the lectures alluded to the cultural skill of gardeners in this country. Do you consider them equal in capacity to the gardeners who are trained on the Continent?

A. Judging them by their all round capacity as growers of flowers, fruit, and vegetables, I believe the best British gardeners are equal to any in the world, and superior to most.

Q. But it has been many times suggested that they must be behind the continental gardeners because there are no proper schools for teaching gardening in this country. What is your opinion on the point?

A. It is very decidedly that there are by no means sufficient grounds for any such suggestion. There are no schools on the Continent in which practical gardening in all departments is so well carried out as in hundreds of well appointed gardens in this country; and for acquiring knowledge of plants and their

culture, not fruit and vegetables, the Royal Gardens, Kew, have no equal anywhere.

Q. But are not the horticultural exhibitions on the Continent, especially in Belgium, much superior to our own?

A. Only in a few specialties in plants. As representative of horticulture on a broader basis, and in its various aspects, the shows bear no comparison with the best of our home exhibitions, in which not only plants and flowers but fruit and vegetables are seen in such splendid condition.

Q. We have been led to believe that no gardens equal those in Belgium. Have you seen them?

A. I have seen many of them, the best being those of the King at Laeken; but these are not managed by a Belgian but by a Scotchman, Mr. Knight; and it is a fact that Mr. J. Everaerts, Senator, Antwerp, had his gardener taught English in order that he could read the *Journal of Horticulture*, and practise British methods of cultivation, as he does with great success.

Q. That appears to be a complete answer. Do you not think the small cultivators of Belgium, those in the "small holdings paradise," are better off than our working people in England?

A. The Belgian peasantry work hard and long, the plots and crops of many being most creditable to them; but as a body they do not appear to have anything like the home comforts of the English peasantry, and they neither live so well nor dress so well. I am convinced that men in fairly regular employment at home, and who have also good gardens or allotments, are better circumstanced than are the great body of the workers in Belgium.

Q. Then we are not so far behind after all in matters of land cultivation as compared with others, are we?

A. I can best answer that question by saying that when the leading Belgian horticulturists visit this country they are astonished by the extent of our market gardens and the high culture in them, as well as the best private gardens, and they are well aware they have nothing to equal them at home.

Q. As a body, then, do you think the English workers—peasantry—manage their gardens and allotments as well as they are managed in Belgium?

A. As a rule certainly not. We find a few plots at home admirably cultivated, but many indifferently managed, if not neglected. In Belgium badly cultivated plots are the exception, and if the workers did not strive to the utmost to obtain the best possible crops they would starve.

Q. We have found a weak point at last, but you think it can be strengthened? Is not that what you wish us to believe?

A. Undoubtedly; but instead of the weak point being discovered at last it has been recognized from the first, and had prominence in the opening lecture. Until recently little encouragement has been given to our working population to obtain land and take real interest in its tillage; where inducements have been offered and accepted the improvement in small gardens and allotments has been distinctly marked. If the bad cultivators decrease in number and the good increase, as will be the case, there will be an enormous gain in produce, as in the Petworth example, and thus many must be benefited, while none can be injured by the change which it is so desirable to establish in all parts of the kingdom.

THE END

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